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TRACTS Ua-Ub

QUARTERLY REPORT #8
FIELD DATA
VOLUME 2
PART IV

7 602252

SHOUT
SHARE
IT

IV. BIOLOGY

A. Terrestrial Vertebrates

BIRD SPECIES LIST OBSERVER: PEK + CVG MO.: 8 YR.: 76

DAY	SPECIES		G	J COMM	ENTS S	R
0 1	Say's Phoebe	✓	X 8-2			X
	Loggerhead Shrike	✓	X		X	X 8-20
	Rock Wren	✓	X	X 8-9	X 8-2	8-2 X
	Common Flicker	✓		X 8-11		X
	Kestrel	✓	X 8-9	X 8-9	X	
	Redtail Hawk	✓	X	X 8-9	X	X
	Mourning Dove	✓	X	X 8-11	X	X 8-5
	Magpie	✓	X	X 8-8	X	8-2 X
	Robin	✓	X			X 8-16
	Black-throated Gray Warbler	✓		X		
	House Finch	✓		X	X	X 8-19
	Pinon Jay	✓	X 8-11	X 8-10	X	X 8-3
	Turkey Vulture	✓			X	X
0 2	Sage Sparrow	✓			X	
	Black-throated Sparrow	✓	X 8-10		X	X 8-16
	Common Nighthawk	✓	X 8-9	X 8-9	X	X
	Western Meadowlark	✓			X	X 8-13
	Rufous-sided Towhee	✓	X		X	X
	Brewer's Sparrow	✓	X 8-9	X 9-9		X
	Blue-gray Gnatcatcher	✓		X 8-9		X
	Scrub Jay	✓		X 8-9		X
	Yellow-breasted Chat	✓				X
	Sage Thrasher		X 7-11		X	
	Poor-will	✓			?	

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BIRD SPECIES LIST OBSERVER: PEK + CVG MO.: 8 YR.: 76

DAY	SPECIES		COMMENTS			
			G	J	S	R
03	Golden Eagle		X 8-13	X	X	X
	Mountain Bluebird	✓	X 8-16	X 8-9		X
	Chipping Sparrow	✓	X 8-7			X
	Common Raven	✓			X	X 8-5
	Horned Lark	✓			X	
	Western Kingbird	✓	X 8-12			X
	Violet-green Swallow	✓			X	X 8-16
	Hummingbird (Broad-tailed?)	✓		X 8-11	X	
04	Scott's Oriole	✓	X 8-9			X
05	Swainson's Hawk	✓			X	X
06	Black-capped Chickadee	✓				X
	Yellow Warbler	✓				X
10	Williamson's Sapsucker	✓		?		
12	Red-breasted Nuthatch	✓		X		
	Gray Flycatcher	✓		X		
13	Great-blue Heron	✓				X
15	Cliff Swallow	✓				X
	Falcon	✓				X

BIRD SPECIES LIST OBSERVER: PEK + CVG MO.: 4 YR.: 76

DAY	SPECIES		G	I COMMENTS	S	R
16	Ash-throated Flycatcher	✓	X			X
	White-breasted Nuthatch	✓				X
	Willow Flycatcher	✓				?
	Warbling Vireo	✓				X
	Downy Woodpecker	✓				X
	Spotted Sandpiper	✓				X
	Great-horned Owl	✓				X
	Cooper's Hawk	✓				X
17	Northern Oriole (Bullock's)	✓				X
	Prairie Falcon	✓				X
	Brown-headed Cowbird	✓				X
	Swainson's Thrush	✓				X
18	Eastern Kingbird	✓				X
	Rough-winged Swallow	✓				X
	Western Tanager	✓		X		X 8-20
19	Plain Titmouse	✓		X		
	House Wren	✓	X			
	Sharp-shinned Hawk	✓				?
	Marsh Hawk	✓	X		X	
	Lark Sparrow	✓	X			

BIRD SPECIES LIST OBSERVER: PEK+CVG MO.: 7 YR.: 76

DAY	SPECIES	G	I	COMMENTS S	R
20	Hairy Woodpecker ✓				X
	Blue Grosbeak ✓				X
	Black-headed Grosbeak ✓				X
	Green-tailed Towhee ✓				X
23	Gadwall ✓				X
	Teal ✓				X

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HERP SPECIES LIST OBSERVER: PEK+CVC MO.: 8 YR.: 76

DAY	SPECIES	G	J COMMENTS	S	R
01	Desert Striped Whipsnake	X			X 8-16
	Sagebrush Lizard	X 8-9	X 8-9	X	X
02	Gopher Snake	X 8-9	X 8-11	X	
	Desert Short-horned Lizard	X 8-9		X	
03	Side-blotched Lizard	X 8-11	X 8-9	X	X
	Northern Plateau Lizard		X 8-9		X
04	Midget-faded Rattlesnake	X 8-5 W. Hole	X N. Bohart		
09	Western Whiptail	X 8-10	X		X 8-19
	Tree Lizard		X		X 8-17
	Woodhouse's Toad				X
16	Wandering Garter Snake				X
18	Leopard Frog				X

MAMMAL SPECIES LIST OBSERVER: PEK + CVG MO.: 8 YR.: 76

DAY	SPECIES	G	J COMMENTS	S	R
01	Desert Cottontail	X	X 8-9	X	X
	Golden-mantle Squirrel	X 8-3	X 8-10		X
	Whitetail Antelope Squirrel	X	X 8-10	8-2 X	
02	Deer Mouse	X 8-9	X 8-9	X	X
	Apache Pocket Mouse	X 8-9	X 8-9	X	X
	Desert Woodrat	X 8-9	X 8-9	X	X
	Ord Kangaroo Rat	X 8-9		X	X
	Domestic Cattle (Hereford)			X	X
	Bushytail Woodrat		X 8-9		X
	Mule Deer	X 8-10	X 8-11	X	X 8-15
03	Western Harvest Mouse	X 8-10	X 8-10	X	X 8-17
	Coyote	X 8-10	X 8-9	X	
05	Brush Mouse		?	X	X 8-16
	Blacktail Jackrabbit			X	
09	Piñon Mouse	X 8-10	X		
	Cañon Mouse		X		
	Whitetail Prairie Dog			X	X
	Least Chipmunk		X		X 8-17
15	Beaver				X

MAMMAL SPECIES LIST OBSERVER: CHAJPEK MO.: 8 YR.: 76

DAY		SPECIES	G	J COMMENTS	S	P
1	6	Rat	X	X	X	X
		Skunk				X
2	7	Porcupine				X
2	2	California Myotis	X		X	
		Western Pipistrel	X		X	
		Pallid Bat	X			
		Long-legged Myotis	X			
		Long-eared Myotis	X			
		Hoary Bat	Y			
	3	Domestic Horse				X
		Little Brown Myotis	X			
		Yuma Myotis	X			
		Domestic Sheep				X
2	5					

BIRDS SITE: [illegible] WG1 OBSERVER: PeK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS
09	heard pinyon jay ✓			Clear · calm S: 6:50 0-5 mph S: 7:25
	heard sparrow			rabbit 01 · 01 · 05 · 10 m
	Brewer's Sparrow	001	01	
	heard rock wren ✓			
	Brewer's Sparrow	010	01	
	Sage thrasher	005	01	
	Loggerhead shrike ✓	012	01	
	Scott's oriole ✓	015	01	
	Mourning dove ✓	003	01	
10	Sage sparrow ✓	005	02	[illegible] S: 6:55 [illegible] S: 7:20
	Chipping Sparrow ✓	003	04	[illegible] 01-50 m
	Brewer's Sparrow	012	02	
	heard rock wren ✓			
11	heard pinyon jay ✓			[illegible] S: 6:00 0-5 mph S: 7:35
	Pinyon jay ✓	055	15	[illegible] 01 · 01 · 20 · 15 · 75 m
	Pinyon jay	001	01	
	heard sparrow			
	Chipping Sparrow ✓	015	04	
	heard phoebe ✓			
	heard rock wren			
	heard mourning dove ✓			
	Epidonax	007	01	

BIRDS SITE: 2, Greasewood 1°W G1 OBSERVER: PFK MO.: 3 YR.: 7

DAY	SPECIES	DIST.(m)	NO.	COMMENTS
1 1				
1 1	Passerine	0 0 1	0 1	[illegible] 1
1 2	heard phoebe			0-5 mph S:705 clear & cool E:735
	heard rock wren			rock - 01-15-34-20 m
	heard Pinyon jay			
	Passerine	0 0 1	0 1	
	Pinyon jay	0 0 1	0 6	
	heard sparrows			
	Pinyon jay	0 0 1	0 5	
	Brewer's sparrow	0 1 0	0 6	
	Chipping sparrow	0 1 5	0 1	
1 3	Loggerhead shrike	0 3 0	0 1	5-10 mph S:630 hi broken overcast [illegible]
	Pinyon jay	1 5 0	0 3	rocks 01-05-15 m
	END			

BIRDS SITE: Greasewood WG-2 OBSERVER: CVG MO.: 7 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	☒
09	Sparrow ✓	025	04	0% Cld Cvr S 0658 E 0712	
	Sparrow heard ✓			→ Flying over	
	Loggerhead Shrike ✓	001	01	DC 20, 40m, 15m	
10	Black-throated Sparrow ✓	001	02	10% Cld Cvr 0705 0723	
	Rock Wren heard ✓			DC 25m, 25m, 40m, 2m, 40m, 25m, 1m, 25m,	
	PJ heard ✓			60m WAS 20m, 20m	
11	Rock Wren heard ✓			30% Cld Cvr S 0707 Breeze E 0728	
	Black-throated Sparrow heard			DC 3m, 20m, 7m, 1m, 1m, 40m, 50m	
	Rock Wren ✓	025	01		
	Loggerhead Shrike ✓	001	01		
	Sparrow ✓	040	01		
	Rock Wren ✓	040	01		
	PJ heard ✓				
	Pinon Jay ✓	020	06	Flying over	
12	Black-throated Sparrow heard			0% Cld Cvr S 0706 E 0723	
	Rock Wren heard ✓			DC 3m, 4m, 50m WAS 20m, 20m	
13	Golden Eagle ✓	020	02	95% Cld Cvr S 0652 Thunderstorm E 0705	
	Black-throated Sparrow ✓	005	02	→ Flying over	
				DC 40m, 20m, 35m, 20m	

BIRDS SITE: Greasewood 3° WG3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	X
1 6	heard pinyon jays ✓			0-5 mph clear S: 830 E: 900	
	Say's phoebe ✓	0 1 5	0 2	[illegible]	
	Meadow lark ✓	0 0 1	0 3		
	Pinyon jay ✓	0 0 1	2 5		
	Meadow lark ✓	0 0 5	0 1		
	Rock wren ✓	0 5 5	0 1		
	Passerine ✓	0 0 1	0 1	[illegible]	
	Golden Eagle ✓	2 5 0	0 2		
	Ash-throated flycatcher	0 1 5	0 2		
	Mtn. Bluebird ✓	0 3 0	0 1	♀	
1 7	Say's Phoebe ✓	0 0 1	0 1	5-10 mph S. 915 E 930	
	heard rock wren ✓			[illegible]	
	Black-throated sparrow	0 1 5	0 2		
	Rufous sided towhee ✓	0 0 5	0 1		
	Meadow lark	0 2 5	0 2		
1 8	heard rock wren			S: 815 E: [illegible]	
	Black-throated sparrow	0 2 5	0 2	[illegible]	
	Passerine ✓	0 5 5	0 1		
	Meadow lark	0 3 0	0 2		
	heard rock wren ✓				
	Meadow lark	0 1 0	0 1		
	heard pinyon jay ✓				

BIRDS SITE: [illegible] WG3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			NO.		COMMENTS	X
19	heard rock wren						[illegible] S: 815 [illegible] F: 940	
	Pinyon jay ✓	0	0	1	1	2	[illegible] 20 m [illegible] .15 [illegible] .05	
	Black-throated sparrow ✓	0	0	1	0	3	C [illegible] m	
	Ash-throated flycatcher ✓	0	1	5	0	1		
	Sage thrasher ✓	0	0	5	0	1		
	Pinyon jay ✓	0	0	3	0	4		
	Meadow lark ✓	0	4	5	0	1		
	Mtn. bluebird ✓	0	1	0	0	1	?	
	Say's Phoebe ✓	0	0	1	0	1		
	House wren ✓	0	1	5	0	1		
	Lark sparrow ✓	0	2	0	0	1		
20	Black-throated sparrow	0	0	1	0	2	[illegible]	
	Passerine ✓	0	4	5	0	1	[illegible]	
	Meadow lark ✓	0	1	5	0	1	[illegible]	
	Chipping sparrow ✓	0	0	1	0	2		
	heard rock wren							
	Mourning dove ✓	0	5	0	0	2		
	END							

BIRDS SITE: Juniper WJ-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
09	Pinon Jay heard			0% Cld Cvr S 0745 E 0812	
	Rock Wren heard			DC 5m, 20m, 10m, 2m,	
				50m, 50m, 60m, 40m, 50m	
10	Piñon Jay	015	08	40% Cld Cvr S 0758 Breeze E 0821	
	Piñon Jay	025	19	DC 40m, 2m, 7m, 1m,	
	Piñon Jay	035	03	15m, 15m, 5m	
	Sparrow heard				
11	Mountain Bluebird ✓	001	01	40% Cld Cvr S 0805 Breeze E 0828	
	Hummingbird ✓	001	01	DC 25m, 1m, 4m, 5m, 2m, 2m, 20m, 5m,	
				15m WAS 20m	
12	Mountain Bluebird ✓	025	06	0% Cld Cvr S 0803 E 0832	
	↓ ✓	015	01	DC 10m, 7m, 15m, 35m, 2m, 7m, 2m, 4m, 50m	
	Piñon Jay ✓	030	01	40m	
	Gray Flycatcher ✓	001	01	15m S 20m Lchip 5m, 20m, 5m	
	Piñon Jay ✓	050	02		
13	Mountain Bluebird ✓ heard			[illegible] S 0740 [illegible] E 0803	
	Sparrow heard			Lt Fair wind	
				DC 7m, 1m, 5m, [illegible]	

BIRDS SITE: Juniper 2° WJ2 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
16	heard Sparrow ✓			Clear S:725 [illegible] E:750	
	Say's phoebe ✓	025	01	[illegible] – 01.05 [illegible]	
	Hummingbird ✓	001	01		
	Rock wren ✓	045	01		
	Black-throated sparrow ✓	001	02		
	Epidonax ✓	025	01		
17	Passerine ✓	001	01	[illegible] 830 [illegible] 850	
	Pinyon jay ✓	055	10	[illegible]	
	Mtn. bluebird ✓	030	01		
	heard rock wren ✓				
18	heard rock wren ✓			:715 :742	
	heard pinyon jay ✓			[illegible]	
	Mtn bluebird ✓	005	03		
	Epidonax ✓	035	01		
19	heard sparrow ✓ black throated			[illegible] S:720 [illegible] E:745	
	Pinyon jay ✓	055	03	[illegible]	
	Pinyon jay ✓	001	25		
	heard rock wren ✓				
	Chipping Sparrow ✓	005	01		
	Mtn bluebird ✓	002	01		
	Rock wren ✓	020	01		

BIRDS SITE: Juniper 2° WJ2 OBSERVER: PEK MO.: 9 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	X
20	Say's Phoebe ✓	030	01	[illegible] S:730 753	
	mtn bluebird ♂ ✓	001	01		
	heard pinyon jay ✓				
	Passerine	050	01	sparrow	
	heard rock wren				
	END				

BIRDS SITE: Juniper 3° WJ 3 OBSERVER: [illegible] MO.: [illegible] YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
09	heard pinyon jays ✓			clear, calm [illegible] S: 7[illegible] E: [illegible]	
	Brewer's sparrow ✓	001	01	[illegible]	
	Rock wren ✓	005	01		
	Passerine ✓	001	01		
	House finch ✓	010	02		
10	Loggerhead Shrike ✓	025	01	5-10 mph, partly cloudy S: 745 E: 907	
	Common flicker ✓	040	01	[illegible]	
	Rock wren ✓	030	01		
11	heard rock wren ✓			[illegible] S: 750 E: [illegible]	
	heard pinyon jay ✓			[illegible]	
12	heard pinyon jay ✓			[illegible]	
	heard rock wren				
	Red-breasted nuthatch	010	01		
	Rock wren ✓	035	01		
	Passerine ✓	001	01	sparrow	
13	heard pinyon jay			[illegible] 835 [illegible]	
				[illegible]	

BIRDS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES		DIST.(m)	NO.	COMMENTS
02	Sparrow heard				90% Cld Cvr S 0650 Light Rain E 0728
	Sage Sparrow	✓	001	02	} family
	Sage Sparrow	✓	002	01	
	Sage Sparrow	✓	015	03	
	Loggerhead Shrike	✓	035	01	DC 30m, 7m, 25m 1m, 15m, 1m
	Common Nighthawk	✓	020	01	
	Loggerhead Shrike	✓	025	01	
	Sparrow heard	✓			
	Piñon Jay heard	✓			
	Mourning Dove heard	✓			
	Sparrow		020	01	
	Rock Wren		020	01	
	Rock Wren	✓	015	01	
03	Piñon Jay	✓	010	01	40% cld cvr S 0650 Wind E 0729
	Piñon Jay	✓	40	01	Grnd wet Rain last nite
	Piñon Jay	✓	100	20	Coyote heard DC 5m, 10m, 4m, 5m
	Meadowlark heard	✓			
	Sage Sparrow		001	02	
	Sage Sparrow	✓	070	02	
	Loggerhead Shrike		005	01	
	Sage Sparrow		001	01	
	Western Meadowlark	✓	035	01	
	Horned Lark	✓	010	01	

BIRDS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	╳
03	Black throated Sparrow ✓	015	02		
	Sparrow ✓	040	02		
	Rock Wren heard ✓				
04	Sage Sparrow heard			1% Cld Cvr S 0651 Breeze E 0722	
	Meadowlark ✓	060	01	Rain last night Grnd wet	
	Loggerhead Shrike ✓	001	01	DC 1m, 2m	
	Shrike heard ✓				
	Mourning Dove ✓	040	01		
	Rock Wren heard				
05	Meadowlark ✓	005	01	0% Cld Cvr S 0648 E 0723	
	Meadowlark heard ✓			DC 70m, 15m. 40m	
	Sage Sparrow ✓	060	03		
	Sage Sparrow heard ✓				
	Sage Sparrow ✓	015	03		
	Sage Sparrow ✓	005	01		
	Meadowlark ✓	010	02		
	Loggerhead Shrike ✓	001	01		
	Loggerhead Shrike ✓	040	01		
	Meadowlark heard				
	Sage Sparrow	001	02		
06	Piñon Jay heard			0% Cld Cvr S 0647 E 0722	
				DC 2m, 1m, 20m, 5m,	

BIRDS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES		DIST.(m)	NO.	COMMENTS	X
06	Sage Sparrow heard	✓				
	Sage Sparrow	✓	060	04		
	Piñon Jay	✓	150	02		
	Kestrel	✓	040	01		
	Meadowlark	✓	005	01		
	Sage Sparrow	✓	020	02		
	Loggerhead Shrike	✓	020	01		
	Meadowlark	✓	005	01		
	Rock Wren	✓	003	01		
	Sage Sparrows heard	✓				

BIRDS SITE: Sh[illegible] Scale WS-2 OBSERVER: CVG MO.: 5 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	X
02	Piñon Jay heard ✓			90% Cld Cover S 0742 E 0758	
	Rufous-sided Towhee ✓	040	01	Im.	
	Sparrow heard			DC 20m, 3m	
	Meadowlark heard ✓				
03	Meadowlark heard			20% Cld Cvr Grd wet Rain S 0742 E 0759	
	Rufous-sided Towhee ✓	050	02	last night wind	
	Meadowlark ✓	001	01	DC 2m	
	Meadowlark ✓	010	02		
	Sage thrasher ✓	001	01		
	Meadowlark ✓	010	02		
	Meadowlark ✓	015	02		
04	Meadowlarks heard ✓			7% Cld Cvr Breeze S 0735 E 0751	
	Hummingbird	001	01	Rain Last night Grnd Wet	
	Piñon Jay heard ✓			DC 2m, 80m	
05	Meadowlark heard ✓			0% Cld Cvr S 0736 E 0749	
	Meadowlark ✓	050	02	DC 35m, 1m, 1m	
	Sage Sparrow	001	01		
	Meadowlark	002	02		
06	Piñon Jay	015	10	0% Cld Cvr S 0735 E 0753	
	Piñon Jay	005	06	foraging flock	
	[illegible]			DC 1m	

BIRDS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	☒
06	Piñon Jay ✓	020	17	- foraging flock	
	Kestrel ✓	200	01		

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BIRDS SITE: Shadscale 20 WS3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS
02	Loggerhead Shrike ✓	075	01	0-5 mph S: 700 overcast E: 720
	heard passerine · sparrow?			rabb – 05·02 m
	heard sage thrasher ✓			
03	Sparrow brewers? ✓	010	01	5-10 mph S: 700 partly cloudy E: 725
	heard pinyon jay ✓			[illegible] rabbit 02 · 15 · [illegible]
04	heard meadow lark ✓			0-5 mph clear S 705 [illegible] E 730
	Pinyon jay ✓	025	20	rabbit 01 · 01 [illegible]
	heard passerine			
	heard rock wren ✓			
	Sage Sparrow ✓	005	01	
	heard sage thrasher ✓			
	heard raptor			
05	Sage thrasher ✓	010	01	5-10 mph clear S: 655 wind E: 720
	Sparrow sage?	003	01	rabbit – 01 m
06	heard pinyon jays ✓			clear & calm S: 655 rabb · 02·01·20·50·35 m E: 715
	heard sparrow?			
	END			

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BIRDS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	☒
16	Cliff Swallow ✓	001	02	1% Cld Cvr S 0837 E 0909	
	Robin heard ✓			Mule Deer 30M	
	Flicker heard ✓				
	Yellow Warbler ✓	010	01		
	Yellow Warbler heard ✓				
	Blue-gray Gnatcatcher heard ✓				
	Warbling Vireo ✓	007	01		
	Rufous-sided Towhee heard ✓				
	Magpie ✓	040	01		
	Magpie heard ✓				
	Cliff swallow ✓	015	01		
	Warbler ✓	001	01		
	Say's Phoebe ✓	005	01	Molt	
	Yellow Warbler ✓	001	01		
	White-breasted Nuthatch ✓	005	01		
17	Spotted Sandpiper ✓	010	01	85% Cld Cvr S 0735 E 1001	
	Cliff Swallow ✓	015	01	DC 3M Cow 30M. 10M. 40M. 35M.	
	↓ ✓	040	02	15M Calf 40M. 40M. 40M	
	Common Nighthawk ✓	001	01		
	Golden Eagle ✓	001	01		
	Passerine (Warbler or Sparrow) ✓	001	01		
	Robin ✓	025	03		
	Yellow Warbler heard ✓				
	Nuthatch heard ✓				

BIRDS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS
17	Oriole heard ✓			
	Passerine ✓	030	01	
	Cliff Swallow ✓	005	02	
18	Cliff Swallow ✓	100	04	0%c [illegible] S0832 E0902
	Rough-winged Swallow ✓	100	02	DC 5M, 15M, 60M Cov 40M, 40M [illegible]
	Magpie heard ✓			100M 30M. 70M [illegible] 40M
	Robin ✓	015	01	Bill, 1M, 1M
	Flicker heard ✓			
	Robin	030	01	
	Robin	007	01	
	Yellow Warbler ✓	035	01	
	Rock Wren heard ✓			
	Rufous-sided Towhee ✓	005	01	
	Rufous-sided Towhee ✓	015	01	
	Yellow Warbler ✓	030	01	
	Yellow Warbler heard ✓			
	Magpie ✓	005	01	
19	Say's Phoebe ✓	015	01	10%c [illegible] S0825 E0955
	Mourning Dove ✓	015	02	NB 60M DC 10M. 10M 5M 1M.
	Spotted Sandpiper ✓	005	01	15M Cov 40M. 40M 40M 40M.
	Yellow Warbler heard ✓			30M, 15M Cliff 40M. 40M. 40M. 15M
	Cliff Swallow	003	02	[illegible] P

D 2 of 3

BIRDS SITE: [illegible] WR-1 OBSERVER: CVG MO.: 7 YR.: 74

DAY	SPECIES	DIST. (m)			NO.		COMMENTS	☒
19	Chipping Sparrow ✓	0	2	0	0	2		
	Black-capped Chickadee heard ✓							
	Rock Wren heard ✓							
	Yellow Warbler heard ✓							
	Magpie heard ✓							
	Sparrow ✓	0	0	3	0	1		
	Brewer's Sparrow ✓	0	0	1	0	1		
	Sparrow ✓	0	1	0	0	1		
	Say's Phoebe	0	3	0	0	2		
	Say's Phoebe ✓	0	6	0	0	1		
	Western Tanager ✓	0	1	0	0	1	5% Cld Cvr S 0848 F 0915	
20 ↑	Yellow Warbler heard ✓							
	Rock Wren heard ✓							
	Robin heard ✓							
	Hairy Woodpecker	0	1	0	0	1		
	Black-capped Chickadee heard ✓							
	Yellow Warbler ✓	0	0	3	0	1		
	↓ ✓	0	1	5	0	1		
	Rufous-sided Towhee heard ✓							
	Common Nighthawk ✓	0	2	0	0	1		
	Yellow Warbler heard ✓							
	Sparrow ✓	0	1	0	0	1		
	3 - 3							

BIRDS SITE: Riparian WR-2 OBSERVER: CVG MO.: 5 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
16	Red-tailed Hawk ✓	015	01	0% S [illegible]21 E [illegible]58	
	Downy Woodpecker ✓	030	01	DC 5m, 1m, 30 1m	
	Yellow Warbler ✓	005	01	Cattle 7m, 30m, 15m, 50m 50m 30m 30m, 10m	
	Rock Wren heard ✓				
	Mourning Dove heard ✓				
	Mourning Dove ✓	040	02		
	Rufous-sided Towhee heard ✓				
	Yellow Warbler ✓	005	01		
	Common Flicker ✓	070	01		
	Rufous-sided Towhee ✓	015	01		
	Wren ✓	015	01		
	Black-capped Chickadee ✓	001	02		
	Spotted Sandpiper ✓	060	01		
	Yellow Warbler ✓	007	01		
7	Rufous-sided Towhee heard ✓			85%, Ci Cu S 0825 E 0857	
	Mountain Bluebird ✓	020	01	DC 5m, 3m, 5m, 30m Calf 15m	
	Spotted Sandpiper ✓	001	01	Cow 20m	
	Warbler ✓	001	01		
	Red-tailed Hawk ✓	001	01		
	Passerine ✓	060	01		
	Flickers heard ✓				
	Yellow-breasted Chat ✓	040	01		
	Rock Wren heard ✓				
	Page 1 of 4				

BIRDS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS
17	Robin heard ✓			
	Yellow Warbler ✓	002	01	
	Rock Wren ✓	035	01	
	Scrub Jay ✓	005	01	
	Yellow Warbler heard ✓			
18	Downy Woodpecker ✓	015	01	0%Cld Cvr S0716 F0750
	Magpie ✓	080	01	DC 10M, 12M. 2M, 4M, 7M
	↓ ✓	120	01	MD 1M [illegible]
	Passerine	040	01	
	Spotted Sandpiper ✓	040	01	
	Rufous-sided Towhee ✓	020	01	
	Towhee heard ✓			
	Common Flicker ✓	060	04	
	Great Blue Heron ✓	100	01	
	Red-tailed Hawk	100	01	
19	Rufous-sided Towhee heard ✓			10%Cld Cvr S0708 F0745
	Robin heard			MD 5M EC 1M. 10M 1M, 1M.
	Warbler	030	01	20M, 1M
	Passerine	090	02	
	Yellow Warbler	015	01	
	Mourning Dove	001	01	
	Yellow-breasted Chat	012	01	
	D 2 or 4			

BIRDS SITE: Riverview WP-2 OBSERVER: CVG MO.: 9 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
19	Rufous-sided Towhee ✓	012	01		
	Yellow Warbler heard ✓				
	Cooper's Hawk ✓	030	01		
	Yellow Warbler ✓	015	01		
	↓ ✓	030	01		
	↓ ✓	007	01		
	Yellow-breasted Chat ✓	030	01		
	Say's Phoebe ✓	030	01		
	Spotted Sandpiper heard ✓				
20	Falcon ✓	100	01	10% cld cvr S 0721 E 0800	
	Rufous-sided Towhee heard			DC 7m, 5m, 15m, 1m	
	Rough-winged Swallow ✓	030	11	[illegible]	
	Flicker heard ✓				
	Sparrow	020	01		
	Green-tailed Towhee ✓	005	02		
	Sparrow ✓	003	01		
	Common Flicker ✓	040	02		
	Rufous-sided Towhee ✓	002	01		
	Great Blue Heron ✓	040	01		
	Yellow Warbler heard				
	Common Flicker	050	01		
	Rufous-sided Towhee	001	01		
	Passerine	002	01		

3 of 4

BIRDS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			NO.		COMMENTS	X
20	Rufus-sided Towhee heard ✓							
	Yellow Warbler heard ✓							
	Yellow Warbler ✓	0	3	0	0	1		
	Warbler ✓	0	1	5	0	1		
	Blue Grosbeak ✓	0	2	0	0	1		

Pd :d

BIRDS SITE: Riparian 3" WR3 OBSERVER: PEK MO.: 3 YR.: 76

DAY	SPECIES	DIST. (m)	NO.	COMMENTS	☒
02	heard towhee ✓			0-5 mph S:755 overcast E:830	
	Rock wren ✓	045	01	rabbit 01·10·0· ·30·50·25·07 m	
	Brewer's sparrow ✓	015	01		
	Rufous-sided towhee ✓	025	01		
	Common flicker ✓	025	03		
	Blue-gray gnatcatcher ✓	007	01		
	Brewer's sparrow ✓	001	02		
	heard towhee ✓				
	heard gnatcatcher ✓				
	Black-billed magpie ✓	001	02		
	Say's phoebe ✓	045	02		
	heard rock wren ✓				
03	Chipping sparrow ✓	001	01	[illegible] S:[illegible] E:835	
	Golden Eagle ✓	150	01	rabbit 02·05·03·15·12·30 75·40	
	Pinyon jay ✓	001	01		
	Rock wren ✓	045	01		
	heard towhee ✓				
	Rufous-sided towhee ✓	03	01		
	Common flicker ✓	01	04		
	Blue-gray gnatcatcher ✓	025	01		
	heard towhee ✓				
	Passerine ✓	001	01		
	Blue gray gnatcatcher ✓	012	01		

BIRDS SITE: [illegible] 3° wR3 OBSERVER: PEK MO.: 9 YR.: 76

D		SPECIES	DIST.(m)			NO.		COMMENTS	☒
0	3	Rufous-sided towhee ✓	0	0	3	0	1	Continued [illegible]	
		Rock wren ✓	0	0	5	0	1		
0	4	heard towhee ✓						0-5 mph · clear S:805 [illegible] E:835	
		Common nighthawk ✓	0	0	1	0	1	[illegible]	
		Common flicker ✓	0	2	5	0	3		
		heard rock wren ✓							
		heard gnatcatcher ✓							
		Mtn bluebird ✓	0	1	5	0	2	[illegible]	
		Rock wren ✓	0	4	5	0	1		
		Blue-gray gnatcatcher ✓	0	4	0	0	2		
		Yellow-breasted chat ✓	0	3	5	0	1		
		Western kingbird ✓	0	1	2	0	1		
		Brewers sparrow ✓		1	5	0	2		
		Say's phoebe ✓	0	0	1	0	1		
		Blue-gray gnatcatcher ✓	0	0	1	0	2		
		heard towhee ✓							
		Mtn bluebird ✓	0	3	5	0	1	♂ [illegible]	
		Passerine ✓	0	0	1	0	1		
		Pinyon jay ✓	0	3	0	0	2		
		Rock wren ✓	0	0	5	0	1		
		Chipping Sparrow	0	2	0	0	2		
0	5	Rock wren ✓	0	1	5	0	1	[illegible] S:800 [illegible] E:830	
								[illegible]	

BIRDS SITE: [illegible] WRZ OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	NO.	COMMENTS	☒
05	heard gnatcatcher ✓			Cont[illegible] [illegible]	
	Common flicker ✓	001	04	range: 35·15·2[illegible]·55 05·[illegible]·25	
	heard towhee ✓			40 m [illegible]	
	heard rock wren ✓				
	Mtn bluebird ✓	010	01		
	Pinyon jay ✓	055	02		
	Golden Eagle ✓	250	01		
	Chipping sparrow ✓	005	01		
	Blue-gray gnatcatcher ✓	007	02		
	Pinyon jay ✓	001	03		
	Rufous-sided towhee ✓	030	01		
	Brewer's sparrow ✓	002	01		
	Rock wren ✓	001	01		
6	Golden Eagle ✓	075	01	Clear [illegible] 5:30 golden mantled [illegible] 8:30	
	Rufous-sided towhee ✓	015	02	range - 15·01·30·01·02·03 0·20·50 cm	
	Blue-gray gnatcatcher ✓	010	01		
	Common flicker ✓	045	03		
	Epidonax	005	01		
	Common flicker ✓	001	01		
	Blue-gray gnatcatcher ✓	003	02		
	Yellow warbler ✓	005	01		
	Mourning dove ✓	001	01		
	Blue-gray gnatcatcher ✓	003	01		

BIRDS SITE: Riparian 3° W 83 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			NO.		COMMENTS	X
06	Black capped chickadee ✓	0	1	0	0	1	Continued from #3	
	Blue-gray gnatcatcher ✓	0	0	2	0	1		
	Chipping sparrow ✓	0	0	7	0	1		
	heard rock wren ✓							
	heard towhee ✓							
	END							

RODENTS SITE: [illegible] WGL OBSERVER: [illegible] MO.: 9 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS	
09 0	Deer mouse	A	M	0 0 4 0	0 0 1	1	1-1	2-11 snapped [illegible]
	"	J	F	0 0 4 0	0 0 1	1	1-1	4-8 snapped 4-2 [illegible]
	"	A	F	0 0 4 1	0 0 2	1	1-2	5-8 snapped 4-12 "
	"	A	F	0 0 4 2	0 0 5	1	1-5	11-1 [illegible] [illegible]
	"	A	F	0 0 4 3	0 2 0	1	2-5	1-3 [illegible] [illegible]
	"	A	M	0 0 4 1	0 3 8	1	4-1	[illegible] -12 snapped
	"	A	M	0 0 4 2	0 5 3	1	5-5	[illegible]
	"	A	M	0 0 4 3	0 5 9	1	5-11	1-7 snapped
	"	A	F	0 0 4 4	0 6 0	1	5-12	4-4 snapped 7-5 "
	"	A	F	0 0 4 5	0 7 0	1	6-3 p?	11-6 snapped 1-11 "
	"	A	M	0 0 4 4	0 7 6	1	7-4	12-12 " 12-11 "
	"	A	M	0 0 4 5	0 8 3	1	7-11	1-[illegible]
	"	J	F	0 0 4 6	0 8 6	1	7-11	[illegible] 1-2 snapped
	"	A	M	0 0 4 6	0 8 8	1	8-[illegible]	1-11 " 2-11 "
	"	A	F	0 0 4 7	0 9 5	1	8-2	2-7 " 6-1 "
	"	A	F	0 0 4 8	0 9 9	1	9-3	8-1 " 9-5 "
	"	A	F	0 0 4 9	1 1 6	1	10-5	12-10 "
	"	A	F	0 0 5 0	1 1 7	1	10-4	[illegible] 1-10 [illegible]
	"	A	M	0 0 4 7	1 1 9	1	10-2	2-11 " 2-6 "
	"	A	M	0 0 4 8	1 3 8	1	[illegible]-7	3-1 " 3-7 "
								3-10 " 4-8 "
1	Deer Mouse	A	M	0 0 4 9	3	1	1-3	4-5 "
10	"	A	F	0 0 4 1	3	2	1-3	6-1 " 7-12 "
	"	A	F	0 0 5 1	0 1 5	1	2-10	2-12 " 8-10 "
	[illegible] "	A	M	0 0 4 2	0 1 8	2	2-7	2-9 " 2-8 "

RODENTS SITE: Greasewood 1°WG-1 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
10	Deer mice	A	F	0	0	4	2	0	2	0	2	2-5 9-1 snapped 9-2
	"	A	F	0	0	5	2	0	2	2	1	2-3 9-5 11-8
	"	A	M	0	0	5	0	0	3	5	1	3-11 12-11 12-5
	"	A	M	0	0	5	1	0	3	7	1	4-12 day 5 ?-1 snapped
	"	A	M	0	0	5	2	0	4	0	1	4-9 5-1 " 5-11 " hole
	"	A	F	0	0	5	3	0	5	8	1	5-10 6-12 snapped
	"	A	F	0	0	4	4	0	6	1	2	6-12 7-5 snapped
	"	A	F	0	0	4	7	0	6	7	2	6-6 8-1 snap
	"	A	F	0	0	4	5	0	7	0	2	6-3 P? 10-6 snap.
	"	A	F	0	0	5	4	0	8	1	1	7-9 11-4
	"	A	F	0	0	5	5	0	8	2	1	7-10 Pg
	"	A	M	0	0	4	5	0	8	3	2	7-11
	"	A	M	0	0	4	6	0	8	8	2	8-9
	"	A	M	0	0	5	3	0	9	8	1	9-2
	"	A	F	0	0	4	8	1	0	0	2	9-4
	"	A	M	0	0	5	4	1	0	3	1	9-7
	"	AJ	F	0	0	4	6	1	0	7	2	9-11
	"	A	F	0	0	5	6	1	0	9	1	10-12
	"	A	F	0	0	5	7	1	1	0	1	10-11
	"	A	F	0	0	4	9	1	1	6	2	10-5
	"	A	F	0	0	5	0	1	1	7	2	10-4
	"	A	F	0	0	5	8	1	1	9	1	10-2
	"	A	F	0	0	5	9	1	2	0	1	10-1
	"	A	M	0	0	5	5	1	3	2	1	11-12
	[illegible] 17 "	A	M	0	0	5	6	1	4	1	1	12-4

ODENTS SITE: Greasewood 1° WG OBSERVER: PEK MO.: 5 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
10	Deer Mouse	—	—	—	144	—	12-1 escapee
11	Deer mouse	A	F	0041	23	3	1-2
	"	A	M	0049	32	2	1-3
	"	A	F	0060	8	1	1-8
	"	A	M	0050	13	2	2-12
	"	A	F	0051	16	2	2-9
	"	A	M	0057	21	1	2-4
	"	A	F	0052	27	2	3-5
	"	A	M	0051	37	2	4-12
	"	A	M	0052	40	2	4-9
	"	A	F	0043	45	2	4-4
	"	A	M	0042	54	3	5-6
	"	A	F	0047	55	3	5-7 P?
	"	A	M	0043	59	2	5-11
	"	A	F	0044	60	3	5-12
	"	A	M	0046	66	3	6-7
	"	A	F	0045	70	3	6-3 P?
	"	A	F	0053	83	2	7-11
	"	A	F	0056	86	2	7-11
	"	A	M	0044	94	2	8-3
	"	A	M	0058	96	1	8-
	"	A	F	0058	98	2	9-2
	"	A	F	0049	116	3	10-5 pg 3
	53 + 17 "	A	M	0053	119	2	10-2

RODENTS SITE: Greasewood WG-1 OBSERVER: P&K MO.: 3 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	1	Deer Mouse	A	M	0	0	5	5	1	3	2	2	11-12
		"	A	F	0	0	5	7	1	3	4	2	12-11
		"	A	M	0	0	4	8	1	3	6	2	12-9
		"	A	M	0	0	5	9	1	3	8	1	12-7
		"	A	M	0	0	5	6	1	4	1	2	12-4
		"	A	F	0	0	6	1	1	4	2	1	12-3
1	2	Deer Mouse	A	M	0	0	4	9			2	4	1-2
		"	A	F	0	0	6	0			9	2	1-9
		"	A	F	0	0	5	1		1	3	3	2-12
		"	A	M	0	0	5	2		1	7	3	2-8
		"	A	F	0	0	5	2		2	1	3	2-4
		"	A	M	0	0	5	8		2	7	2	3-3
		"	A	F	0	0	4	2		2	8	3	3-4
		"	A	M	0	0	4	1		3	5	2	3-11
		"	A	M	0	0	5	1		3	7	3	4-12
		"	J	M	0	0	6	0		4	0	1	4-9
		"	A	F	0	0	5	5		4	3	2	4-6 Pg
		"		escaped					—	—	—	—	5-6
		"	A	F	0	0	5	3		5	8	3	5-10
		"	A	F	0	0	4	4		5	9	4	5-11
		"	A	M	0	0	4	6		6	6	4	6-7
		"	A	F	0	0	4	5		7	0	4	6-5 Pg
		"	A	F	0	0	5	8		9	4	3	8-3
		out of 17 "	A	F	0	0	6	2		9	8	1	9-3

UDENTS SITE: greasewood WG-1 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
12	Deer Mouse	A	M	0	0	5	4	1	0	3	2	9-7
	"	A	M	0	0	4	5	1	0	8	3	9-12
	"	A	F	0	0	5	6	1	0	9	3	10-12
	"	A	M	0	0	5	5	1	1	0	3	10-11
	"	escaped										10-2
	"	A	F	0	0	5	0	1	2	1	3	11-1
	"	J	M	0	0	6	1	1	2	2	1	11-2
	"	A	F	0	0	6	3	1	2	3	1	11-3
	"	A	F	0	0	4	8	1	2	4	3	11-4
	"	A	F	0	0	5	7	1	3	0	3	11-10
	"	A	M	0	0	4	8	1	3	5	3	12-10
	"	J	F	0	0	4	6	1	3	6	3	12-9
	"	A	M	0	0	6	2	1	3	7	1	12-8
	"	A	M	0	0	5	9	1	3	8	2	12-7
	"	A	F	0	0	6	4	1	3	9	1	12-6
	"	A	M	0	0	5	6	1	4	2	3	12-3
	"	A	F	0	0	6	5	1	4	4	1	12-1
3	Deer mouse	A	M	0	0	4	0			2	2	1-2
			escaped									1-5
	"	A	M	0	0	5	0			4	3	2-11
	"	A	M	0	0	4	6		2	0	5	2-5
	"	A	F	0	0	4	2		2	1	4	2-4
	"	A	F	0	0	5	2		2	8	4	3-4
	15 of 17 "	A	M	0	0	5	2		3	2	4	3-8

ENTS SITE: greasewood 1° WG-1 OBSERVER: DCE MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
13	Deer mouse	A	M	0041	35	3	3-11 Cont. [illegible] from #
	"	A	M	0051	37	4	4-12
	"	A	F	0043	45	3	4-4
	"	A	F	0045	47	5	4-2
	"	A	F	0055	54	3	5-6
	"	A	F	0044	62	5	6-11
	"	A	F	0047	66	4	6-7 pg
	"	A	M	0063	70	1	6-3
	"	A	M	0064	75	1	7-3
	"	A	M	0065	85	1	8-12
	"	A	F	0049	93	4	8-4
	"	A	F	0059	97	2	9-1
	"	—		escapee	—		9-3 [illegible] butter [illegible]
	"	A	M	0054	101	3	9-5
	"	A	M	0045	108	4	9-12
	"	A	F	0066	109	1	10-12
	"	A	F	0050	119	4	10-2
	"	A	M	0047	121	2	11-1
	"	A	M	0056	123	4	11-3
	"	A	M	0059	127	3	11-7
	"	A	F	0067	133	1	12-12
	"	A	F	0068	140	1	12-5 pg
	"	A	M	0066	144	1	12-1

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ODENTS SITE: Greenwood 1° WG OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
09	Apaché Pocket	A	M	0	0	2	5	0	0	3	1	1-3
	"	A	F	0	0	2	6	0	6	7	1	6-6
	"	A	F	0	0	2	7	0	8	1	1	7-9
10	Apaché pocket	A	F	0	0	0	1	0	0	4	1	1-4 last year's marking
	"	A	F	0	0	2	8	0	0	8	1	1-8
	"	A	F	0	0	2	9	0	5	3	1	5-5
	"	A	F	0	0	2	7	0	6	0	2	5-12
	"	A	F	0	0	0	8	0	9	5	1	8-2 last year's mark
	"		---					1	0	5	--	9-9 escape
	"	A	F	0	0	3	0	1	4	3	1	12-2
1	Apaché pocket	A	F	0	0	3	1			4	1	1-4
	"	A	F	0	0	3	2		4	8	1	4-1
	"	C	M	0	0	2	5		4	3	2	4-6
	"	A	F	0	0	2	9		6	7	2	6-6
	"	A	M	0	0	3	3		9	3	1	8-4
	"	A	F	0	0	0	8		9	7	2	9-1
	"	A	M	0	0	3	4	1	0	5	1	9-9
	"	A	M	0	0	3	5	1	0	9	1	10-12
	"	A	M	0	0	3	6	1	3	7	1	12-8
12	Apache Pocket	A	F	0	0	3	1			4	2	1-4
	"	A	F	0	0	2	8			8	2	1-8
	p7of17	A	M	0	0	2	5		5	2	3	5-4

RODENTS SITE: Greasewood WG OBSERVER: P&K MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS.
12	Apache Pocket	A	F	0026	55	2	5-7
	"	A	F	0027	60	3	5-12
	"	A	F	0037	86	1	8-11
	"	A	F	0008	95	3	8-2
	"	A	M	0034	105	2	9-9
	"	A	M	0033	116	2	10-5
	"	A	M	0035	132	2	11-12
	"	A	F	0030	143	2	12-2
13	Apache pocket	A	F	0031	004	3	1-4
	"	A	F	0028	16	3	2-9
	"	A	M	0038	40	1	4-9
	"	A	F	0039	51	1	5-3
	"	A	M	0025	56	4	5-4
	"	A	F	0026	55	3	5-7
	"	A	F	0027	60	4	5-12
	"	A	M	0033	92	3	8-5
	"	A	F	0030	143	3	12-2

ODENTS SITE: Greasewood 4° WGI OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Ord's Kangaroo Rat				017	X	II-8 escape
	"	A	M	0020	028	1	3-4
	"	A	M	0021	034	1	3-10
	"	A	M	0022	084	1	7-12 [illegible]
	"	A	M	0015	115	1	10-6 last years mark
10	Ord's Kangaroo Rat	A	M	0020	021	2	2-4
	"	A	M	0002	031	1	3-7 last year mark
	"	A	M	0021	038	2	4-11
	"	A	M	0006	057	1	5-9 last years mark
	"	A	M	0023	075	1	7-3
	"	A	M	0022	085	2	8-12
	"	A	M	0015	089	2	8-8
11	Ord's Kangaroo Rat	J	F	0024	17	1	2-8
	"	A	M	0020	28	3	3-4
	"	A	M	0002	31	2	3-7
	"	A	M	0006	57	2	5-9
	"	A	M	0022	61	3	6-12
	"	A	M	0021	62	3	6-11
	"	J	F	0025	69	1	6-4
	"	A	M	0023	74	2	7-2
	"	A	F	0019	87	1	3-10 [illegible]
	p7 of 17 "	escaped					9-7
	"	A	M	0026	144	1	12-1

RODENTS SITE: greasewood iwGI OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	2	Ords Kangaroo	A	F	0	0	2	7			5	1	1-5
		"	J	F	0	0	2	4			7	2	1-7
		"	J	F	0	0	2	5		2	2	2	2-3
		"	A	M	0	0	0	2		3	1	3	3-7
		"	A	M	0	0	2	1		3	8	4	4-11
		"	A	m	0	0	2	2		6	1	4	6-12
		"	A	M	0	0	2	3		7	3	3	7-1
		"	A	M	0	0	0	6		8	2	3	7-10
		"	A	F	0	0	1	9	1	0	7	2	9-11
		"	A	M	0	0	1	5	1	0	2	3	10-6
1	3	Ord Kangaroo Rat	A	F	0	0	2	4		1	8	3	2-7
		"	A	F	0	0	2	7		1	9	2	2-6
		"	A	M	0	0	2	0		2	2	4	2-3
		"	J	F	0	0	2	5		2	7	3	3-3
		"	A	M	0	0	2	1		3	3	5	3-9
		"	A	M	0	0	0	6		6	4	4	6-9
		"	A	M	0	0	1	8		7	3	1	7-1
		"	A	M	0	0	2	2		8	4	5	7-12
		"	A	M	0	0	2	3		9	6	4	8-1
		"	A	F	0	0	1	9	1	0	6	3	9-10
		"	A	M	0	0	1	6	1	1	4	1	10-7 las [illegible]

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ODENTS SITE: Greasewood 1° WGL OBSERVER: PEK MO.: 5 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
0	9	white tailed Ant. Sq.	A	F	0	0	0	3	0	3	9	1	4-10 old mark
		"	A	M	0	0	0	4	1	4	4	1	12-1 two no. 4's
1	0	White-tailed Ant Sq.	A	F	0	0	1	1	0	1	6	1	2-9
		"	A	F	0	0	1	2	0	4	6	1	4-3
		"	A	F	0	0	1	3	0	5	9	1	5-11
		"	A	M	0	0	1	4	0	8	6	1	8-11
		"	A	F	0	0	1	5	1	2	8	1	11-8
1	1	White-tailed Ant.Sq.	A	M	0	0	0	4		2	0	2	2-5
		"	A	F	0	0	0	3		3	6	2	3-12
		"	A	F	0	0	1	1		7	9	2	7-7
		"	A	F	0	0	1	3		8	5	2	9-12
		"	A	M	0	0	1	6	1	0	7	1	9-11
		"	A	F	0	0	1	2	1	1	4	2	10-7
		"	A	F	0	0	1	7	1	2	1	1	11-1
		"	A	F	0	0	1	8	1	2	4	1	11-4
		"	A	F	0	0	1	9	1	4	3	1	12-2
		"											
1	2	White-tailed Ant. Sq.	A	F	0	0	1	1		4	5	3	4-4
		"	A	F	0	0	2	0		4	7	1	4-2
		"	J	M	0	0	2	1		6	2	1	6-11
		"	escape					—			---	-	7-2
			A	M	0	0	1	4		8	1	2	7-9
		011.517 "	A	M	0	0	2	2		8	7	1	8-10

ODENTS SITE: Greasewood WG1 OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	2	White-tail Antelope Sq	A	F	0	0	1	3		8	6	3	
			A	F	0	0	0	2		9	2	1	
			A	M	0	0	2	3	1	0	0	1	
			A	F	0	0	1	2	1	1	4	3	
			A	F	0	0	1	7	1	1	7	2	
			A	M	0	0	2	4	1	3	1	1	
			A	M	0	0	1	6	1	3	3	2	
			A	F	0	0	1	8	1	4	1	2	
	3	White-tailed Ant S.	A	M	0	0	0	4	0	0	7	3	1-7
		"	A	M	0	0	1	4	0	8	0	3	7-8
		"	J	m	0	0	2	1	1	0	7	2	9-11

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ENTS SITE: Greasewood WG1 OBSERVER: PFE MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
0	9	DESERT WOODRAT	J	F	0	0	0	1	0	4	2	1	4-7
		"	A	M	0	0	0	2	0	6	3	1	6-10
1	0	Desert Woodrat	J ~~A~~	F	0	0	0	1	0	4	2	2	4-7
		"	A	M	0	0	0	2	0	6	3	2	6-10
		"	A	M	0	0	0	3	1	2	1	1	11-1
1	1	Desert Woodrat	J	F	0	0	0	4		2	3	1	2-2
		"	J	F	0	0	0	1		4	2	3	4-7
		"	A	M	0	0	0	2		6	3	3	6-10
		"	A	M	0	0	0	5		7	5	1	7-3
		"	A	M	0	0	0	3	1	2	0	2	10-1
1	2	Desert Woodrat	J	F	0	0	0	1		3	2	4	3-8
		"	J	F	0	0	0	4		5	3	2	5-5
		"	A	M	0	0	0	2		6	3	4	6-10
		"	A	M	0	0	0	5		7	5	2	7-3
		"	A	M	0	0	0	3	1	2	0	3	10-1
	3	Desert Wood Rat	J	F	0	0	0	1		4	2	5	4-7
		"	J	F	0	0	0	4		4	4	3	4-5
		"	A	M	0	0	0	2		5	7	5	5-9
		"	A	M	0	0	0	5		9	5	3	8-2
		p 13 + 17											

ODENTS SITE: Greasewood 1° WG OBSERVER: PEK MO.: 8 YR.: 7

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Desert Cottontail	—	—	NONE	—		—
10	Desert Cottontail	J	?		027	1	3-3 damaged leg
11	NONE						
12	NONE						
13	Desert Cottontail	—	—	—	—	—	—

014.f17

ODENTS SITE: Greasewood WGI OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
8 0	9	Pinyon Mouse	—	—	N	O	N	E	—	—	—	—	
1	0	Pinyon mouse	A	F	0	0	0	1	0	0	6	1	1-6
1	1	Pinyon Mouse	A	F	0	0	0	1			6	2	1-6
1	2	Pinyon Mouse	A	F	0	0	0	1			6	2	1-6
1	3	Pinyon mouse	A	M	0	0	0	2		1	3	1	2-12
		" "	A	F	0	0	0	1		3	1	4	3-7

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RODENTS SITE: Quensa[illegible] PWG OBSERVER: PEK MO: 3 YR: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Western Harvest Mouse	—	—	NONE	—	—	
10	Western Harvest	A	M	0007	108	1	9-12
11	Western Harvest	J	M	0003	052	1	5-4
	"	A	F	0004	073	1	7-1 Pg.
	"	J	F	0005	108	1	9-12
12	Western Harvest.	A	M	0006	051	1	5-3
13	Western Harvest	A	M	0006	006	2	1-6

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ODENTS SITE: Greasewood #1 WG-1 OBSERVER: PEK+TS MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
08	Least Chipmunk											
10												
11	Least chipmunk	A	m	0	0	0	2	1	2	2		10-2
12												
13	Least Chipmunk	A	M	0	0	0	2	1	2	0		10-1

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RODENTS SITE: Greasewood WG-2 OBSERVER: CVG MO.: 9 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Deer Mouse	A	M		003	1	
		A	M		012	1	
		A	F		014	1	
		A	M		021	1	
	↓	A	F		022	1	
	Apache Pocket Mouse	A	M		023	1	
10	Apache Pocket Mouse	A	M		001	1	
	Deer Mouse	A	F		005	1	
	Western Harvest Mouse	A	M		006	1	
	Apache Pocket Mouse	A	F		007	1	
	Deer Mouse	A	F		9	1	
		A	M		10	1	Big Devil
	↓	A	M		12	2	
	Apache Pocket Mouse	A	X		16	1	
	Deer Mouse	A	M		24	1	
11	Deer Mouse	A	M		001	2	
		A	F		6	2	
		A	F		7	2	
		A	M		8	1	Another Big Devil
		A	F		7	2	
		A	M		10	2	Same Big Devil
	↓	A	F		12	1	Preg.

ODENTS SITE: Greasewood WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
11	Deer Mouse	A	m		15	2	SA
	Apache Pocket Mouse	A	m		16	1	
	↓	A	m		19	2	
	Deer Mouse	A	m		20	2	
	↓	A	m		21	1	
	↓	A	m		22	1	
12	Deer Mouse	A	m		1	2	
	Western Harvest Mouse	A	m		2	2	
	Deer Mouse	A	m		3	1	
	↓	A	m		4	2	
	↓	A	m		7	2	Big D
	Apache Pocket Mouse	A	F		8	2	Torpor
	Deer Mouse	A	m		9	1	
	Apache Pocket Mouse	A	m		10	2	Torpor
	↓	A	F		11	1	Torpor
	Deer Mouse	A	m		12	2	Big D, Torpor
	Whitetail Antelope Sq	A	F		13	1	
	Apache Pocket Mouse	A	m		14	1	
	Deer Mouse	A	F		15	1	Torpor
	↓	A	m		16	2	SA
	Apache Pocket Mouse	A	m		19	2	
	Deer Mouse	A	F		20	2	

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ODENTS SITE: Syco-wood WG-2 OBSERVER: CVG MO.: 7 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
13	Deer Mouse	A	F		1	2	
	↓	A	M		6	2	BB
	↓	A	F		7	2	
	↓	A	M		8	2	SA
	↓	A	M		9	2	
	↓	A	F		10	2	
	↓	A	M		16	2	
	Apache Pocket Mouse	A	M		19	2	
	Deer Mouse	A	F		20	1	
	↓	A	M		21	2	
	↓	A	M		23	2	

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ODENTS SITE: [illegible] 3° WG3 OBSERVER: PFK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
1/6	Deer mouse	A	m		015	1	
	Apache pocket	A	m		016	1	
	Deer mouse	A	F		017	1	
	Desert woodrat	A	m		018	1	
	Deer mouse	A	F		019	1	caught together
	Deer mouse	A	F		019	1	
	Deer mouse	A	F		003	1	pg
	Deer mouse	A	m		004	1	
	Deer mouse	A	m		007	1	
	Ord's Kangaroo	A	m		009	1	
	Deer mouse	A	F		011	1	
	Desert wood rat	A	F		012	1	
7	Bushy-tailed woodrat	A	F		013	1	
	Desert wood rat	A	F		014	2	
	Desert woodrat	A	m		015	2	
	Deer mouse	A	F		016	1	
	Deer mouse	A	m		017	1	
	Ord's Kangaroo	A	m		019	2	
	Deer mouse	A	F		021	1	
	Deer mouse	A	m		024	1	
	Deer mouse	A	F		003	2	pg
	Deer mouse	A	F		006	2	
	Deer mouse	A	m		007	1	

RODENTS SITE: Greasewood 3° WG3 OBSERVER: P.K MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
17	Deer mouse	A	F		006	1	[illegible] #1
	Deer mouse	A	F		008	2	[illegible] door
	Deer mouse	A	F		009	2	
	Deer mouse	A	F		011	2	
18	Deer mouse	A	F		005	2	13 [illegible] snapped
	↓	A	F		006	1	torpor
	Ord's Kangaroo	A	M		007	2	torpor
	Deer mouse	A	F		009	2	
	Apache pocket	A	M		011	2	
	Desert woodrat	A	M		012	2	
	Deer mouse	A	M		014	2	
	Desert woodrat	A	M		015	1	
	Deer mouse	A	F		016	2	
	↓	A	F		021	1	
	Apache pocket	A	F		023	1	
	Deer mouse	A	F		024	1	pg
19	Whitetailed Ant. Sq.	A	M		006	1	
	Deer mouse	A	M		007	1	
	Ord Kangaroo	A	M		008	2	
	Deer mouse	A	M		011	1	
	Bushy-tailed woodrat	A	F		013	2	
	Deer mouse	A	M		014	2	

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SITE: Greasewood 3° WG3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
19	Deer mouse	A	F		016	2	[illegible] form #2
	Bushy tailed woodrat	A	M		018	1	
	Deer mouse	A	F		020	2	Pg
	Deer mouse	A	F		021	2	
	Apache pocket	A	F		024	2	
20	Bushy-tailed woodrat	A	F		013	2	
	Deer mouse	A	F		014	1	
	Deer mouse	A	F		016	1	
	Ord's Kangaroo	A	F		017	1	
	Deer mouse	A	M		018	2	
	Ord Kangaroo	A	M		019	2	
	Deer mouse	A	X		020	X	[illegible]
	Deer mouse	A	F		021	2	
	Deer mouse	A	F		024	2	Pg
	Apache pocket	A	F		001	2	
	Deer mouse	A	M		003	2	
	↓	A	F		004	2	
	↓	A	F		005	2	
	Apache pocket	A	F		006	1	
	Deer mouse	A	F		007	2	
	↓	A	F		008	1	
	↓	A	M		009	1	
	↓	A	F		011	2	
	Bushy tailed woodrat	A	M		012	2	end.

RODENTS SITE: Juniper WI-1 OBSERVER: CVG+DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
09	Desert wood rat	A	M	0	0	0	2	0	7	1	1	
	↓	J	F	0	0	2	1	0	7	2	1	6-1
		A	M	0	0	1	9	0	5	6	1	5-8
		A	M	0	0	2	2	0	6	0	1	5-12
		A	F	0	0	1	2*		8	7	1	8-10
		J	M	0	0	2	3		8	9	1	8-8
		J	F	0	0	2	4		9	1	1	8-6
		A	M	0	0	2	5		7	5	1	7-3
		A	M	0	0	2	6		7	4	1	7-2
		A	F	0	0	0	9		9	5	1	8-2
		A	F	0	0	2	7		9	9	1	9-3
		A	M	0	0	2	9	1	1	2	1	10-9
		J	F	0	0	3	1	1	3	9	1	12-6
	↓	A	F	0	0	0	8	1	2	2	1	11-2
10	Desert Woodrat	A	M	0	0	1	7	0	0	9	1	1-9
		A	M	0	0	0	2	0	1	5	2	2-10
		J	F	0	0	2	1	0	7	2	2	6-1
		A	M	0	0	1	9	0	5	4	2	5-6
		A	M			2	2	0	6	0	2	5-12
		A	F			1	2*	0	8	5	2	8-12
	↓	J	M			2	3	0	8	9	2	8-8

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DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
10	Desert woodrat	A	M	0025	075	2	7-3
		A	F	0009	095	2	8-2
		A	M	0026	096	2	8-1
		J	F	0031	114	2	10-7 (10-2 shut)
							(10-4 9-4 shut)
							(10-9 shut)
		A	M	0029	136	2	12-9 (11-11 shut)
	↓	A	F	0008	142	2	12-3 (12-2 shut)
							(2-8 shut)
11	Desert woodrat	A	M	0028	15	1	2-10 (2-9 shut)
		A	M	0002	14	3	2-11 (1-10 shut)
		J	F	0021	72	3	6-1 (3-9 shut)
		A	M	0022	61	3	6-12 (4-2 shut)
		J	M	0023	79	3	7-7 (4-6 shut)
		A	M	0025	93	3	8-4 (shut 3-3)
		A	F	0009	75	3	7-3 (shut 5-9)
		A	M	0026	95	3	8-2 (8-10 shut)
		A	F	0030	96	1	8-1 (10-4 shut)
		A	F	0027	99	2	1-3 (10-11 shut)
		J	F	0024	101	2	9-5 (11-12 shut)
	↓	A	M	0029	112	3	10-9 (12-11 shut)
							(11-5 shut)
	Page 2 of 18						(11-8 shut 11-3)

ODENTS SITE: Juniper WJ-1 OBSERVER: SVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
1 2	Desert Woodrat	A	M	0 2	0 1 0	4	#4 [illegible] Replaced
		A	M	2 8	0 3 8	4	4-11 5 shut WAS full w sand
		A	M	2 2	0 6 0	4	5-12 (3-9 shut)
		A	M	1 9	0 5 6	3	5-8 (3-1 shut)
		A	M	2 5	0 5 2	4	5-4 (3-3 shut)
		A	M	3 2	0 5 0	1	5-2 4-7 shut
		A	F	3 3	0 7 3	1	7-1 (3-9 shut
		A	F	3 0	0 9 6	2	8-1 (5-1 shut)
		A	M	2 6	0 9 5	4	8-2 (5-4 shut
		A	F	0 9	0 7 5	4	7-3 (8-10 shut
		J	F	2 4	0 7 8	3	7-6 9-10 shut
		J	M	2 3	0 8 1	4	7-9 9-7 shut
		A	F	1 2	0 8 5	3	8-12 9-8 shut
		A	M	2 9	1 1 2	4	10-9 (10-4 shut
		A	F	2 7	0 9 9	3	9-3
		A	F	0 8	1 2 2	3	11-2
	↓	A	F	3 4	1 3 3	1	12-12.
							(2-7 1-7 shut)
1 3	Desert Woodrat	A	M	0 2	1 5	5	2-10 (2-8 shut 2-9 shut)
		A	M	1 7	1 0	2	1-10 3-5 shut whil
		J	F	3 5	1 3	1	2-12
		A	M	2 8	4 0	5	4-9
		A	M	1 9	3 0	4	3-6
	↓	A	M	3 2	4 9	2	5-1

RODENTS SITE: Juniper W(-1 OBSERVER: CVG & DPL MO.: 8 YR.: 7

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
13	Desert Woodrat	A	F	09	50	5	5-2 (6-9 shut)
		A	M	25	54	4	5-4 (7-12 8-12 shut
		A	M	22	61	5	6-12 (7-9 shut)
		J	M	23	88	5	8-9 (8-4 shut
		J	F	24	91	4	8-6 (shut 8-2
		A	F	27	76	4	7-4 (9-1 sh 10-1
		A	M	26	75	5	7-3 (10-4 shut)
		A	F	33	74	2	7-2 (9-10 shut)
		A	F	30	96	3	8-1
		A	M	29	112	5	10-9
		A	F	34	135	2	12-10
	↓	A	F	08	124	4	11-4

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Juniper WJ-1

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Bushytail Woodrat	A	F	0028	113	1	
		A	M	0030	106	1	
10	Bushytail Woodrat	A	M	0032	036	1	3-12
		A	F	0028	103	2	9-7
		A	M	0030	105	2	9-9
		A	F	0033	141	1	12-4
		A	M	0034	124	1	11-4
11	Bushytail Woodrat	A	F	0001	025	1	3-1
		A	F	0028	114	3	10-1
		A	M	0030	106	3	9-10
12	Bushytail Woodrat	A	M	0030	061	4	6-12
		A	F	0028	114	4	10-7
		A	F	33	141	2	12-4
13	Bushtail Woodrat	A	F	01	22	2	2-3
		J	M	02	3	1	1-3
		A	F	30	89	4	8-8
		A	F	26	103	4	9-7
		J	F	03	133	1	12-12

RODENTS SITE: Juniper WJ-1 OBSERVER: CVG+DPL MO.: 8 YR. 96

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	3	Bushytail Woodrat	A	F			3	3	1	4	2	2	12-3

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RODENTS SITE: Juniper WJ-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
0 9	Deer Mouse	A	F	0 0 2 1	0 0 4	1	(5-6 shut)
		A	F	0 0 2 2	0 2 0	1	(6-8 shut)
		A	F	0 0 2 3	0 1 9	1	(8-4 shut w/ ta
					0 1 7		(shut)
					0 2 3		(shut w/ rat tail in
		A	M	0 0 2 4	0 1 6	1	(10-1 shut)
		A	M	0 0 2 5	0 3 8	1	4-11 (10-2 shut
		A	M	0 0 2 6	0 5 0	1	5-2 (11-7 sh
		A	M	0 0 2 7	0 5 5	1	5-7 (11-5 shut
		A	M	0 0 2 8	0 7 6	1	7-4
		A	M	0 0 2 9	0 9 7	1	9-1 9 Traps Shut
1 0	Deer Mouse	A	M	0 0 2 4	0 1 6	2	2-9 (2-6 shut)
		A	F	0 0 3 0	0 1 1	1	1-11
		A	M	0 0 2 5	0 1 3	2	2-12 (2-11 missin
		A	F	0 0 2 3	0 3 0	2	3-6 (4-10 shut)
		A	M	0 0 2 6	0 5 1	2	5-3 (4-9 shut)
		A	F	0 0 2 2	0 6 5	2	6-8 (4-6 sh
		A	M	0 0 2 7	0 7 9	2	7-7
		A	M	0 0 2 9	0 9 4	2	8-3
		A	F	0 0 3 1	1 3 5	1	12-12 (11-10 shut)
1 1	Deer Mouse	A	F	0 0 2 3	0 2 0	3	2-5
		A	F	0 0 2 2	0 4 1	3	4-8
	P7 of 18	A	M	0 0 2 6	0 4 6	3	4-3

RODENTS SITE: Juniper WJ-1 OBSERVER: CVG+DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
11	Deer Mouse	A	F	0032	51	1	5-3
		A	M	0027	55	3	5-7
		A	M	0029	120	3	10-1
		A	F	0033	100	1	9-4
		A	X		107	X	9-11
		A	F	0030	133	2	12-12
		A	F	0015	135	1	12-10
		A	F	0034	127	1	11-7
	↓	A	M	0035	139	1	12-6
12	Deer Mouse	J	M	36	3	1	
		A	F	21	7	2	
		A	M	24	11	3	
		A	M	27	16	4	2-9
		A	F	23	18	4	2-7
		A	F	37	48	1	4-1
		A	F	32	47	2	4-2
		A	M	38	26	1	3-2
		A	F	22	30	4	3-6
		A	M	26	70	4	6-3
		A	F	33	91	2	8-3 (Ants)
							#25 killed by RS
		A	M	29	123	4	11-3
		A	M	35	139	2	12-6
	↓ P8 of 18	J	M	39	136	1	12-9

SITE: Juniper WJ-1 OBSERVER: CVG, DPL Mo.: 8 YR. 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
12	Deer Mouse	A	F	15	135	2	12-10
	↓	A	F	30	130	3	11-10
13	Deer Mouse	A	M	27	5	5	1-5
		A	M	49	8	1	1-8
		A	F	30	14	4	2-11
		J	M	41	41	1	4-8
		A	M	38	26	2	3-2
		A	F	37	72	2	6-1
		A	M	26	51	5	5-3
		A	F	42	66	1	6-7
		A	M	29	94	5	8-3
		A	M	28	104	2	9-8
		A	F	15	132	3	11-12
	**	A	F	30	134	X	12-11
		A	M	43	127	1	11-7
	↓	A	M	35	139	3	12-6
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RODENTS SITE: Juniper WJ-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Pinyon mouse	A	M	0010	025	1	
		A	F	0011	048	1	4-1
		A	F	0012	069	1	6-4
		A	M	0013	109	1	10-12
		J	M	0014	133	1	12-12
		A	F	0015	134	1	12-11
10	Piñon Mouse	A	M	0010	038	2	4-11
		A	F	0011	050	2	5-2
		A	F	0015	066	2	6-7
		A	M	0011	101	1	9-5 ✳
		A	M	0013	109	2	10-12
		J	M	0014	134	2	12-11
		A	F	0001	122	1	SA. 11-2 ? tail longer than body
							8-11 about
11	Piñon Mouse	A	F	0001	019	2	2-6
		A	M	0010	038	3	4-11
		A	F	0002	040	1	4-9
		A	F	0012	047	2	4-2
		A	M	0013	109	3	10-12
		J	M	0014	130	3	11-10
		A	F	0015	129	3	11-9
		A	F	0003	137	1	12-8
	P 10 of 18						
12	Piñon Mouse	A	F	0004	024	1	2-12

ODENTS SITE: Juniper WJ-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
12	Piñon Mouse	A	M	10	14	4	2-11
		A	F	0001	65	3	6-8
		A	F	15	55	4	5-7
		A	F	12	72	3	6-1 (Ants)
		A	M	13	109	4	10-12
		A	M	05	118	1	12-3
		A	F	03	134	2	12-11
		J	M	14	131	4	11-11
13	Piñon Mouse	A	F	04	11	2	1-11
		A	M	10	12	5	1-12
		A	F	02	34	2	3-10
		A	F	01	56	4	5-8
		A	M	05	100	2	9-4
		J	M	14	111	5	10-10
		A	M	13	109	4	10-12
		A	F	15	130	5	11-16
		A	F	03	136	3	12-7
		A	F	06	143	1	12-2

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RODENTS SITE: Juniper WT-1 OBSERVER: CVG+DPL MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
0	9	Desert cottontail	A	X	0	0	0	2	0	3	1	1	
	|	↓	A	F	0	0	0	3	0	7	9	1	7-7
1	0		A	X					0	4	8	X	(Lost) 4-1
1	0		A	F	0	0	0	3	1	3	2	2	11-12
1	1	Desert cottontail	A	F	0	0	0	2	0	5	4	2	5-6
		↓	A	F	0	0	0	3	0	8	0	3	7-8
1	2	D. C	A	M	0	0	0	4		6	2	1	6-11
		↓	A	F			0	3	1	0	7	4	9-11
1	3	Desert Cottontail	A	F				2		8	7	3	8-10

RODENTS SITE: Juniper WJ-1 OBSERVER: CVG & DPL MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
0	9	Least Chipmunk	A	M	0	0	0	5	0	8	3	1	7-11
			A	F	0	0	0	6	0	8	8	1	8-9
			A	M	0	0	0	2	0	9	8	1	9-2
1	0	Least Chipmunk	A	M	0	0	0	2	0	4	1	2	4-8
1	1	Least Chipmunk	A	M	0	0	0	2	0	7	0	3	6-3
			A	M	0	0	0	5	0	8	5	2	8-12
			A	X					1	4	3	X	12-2
1	2	Least Chipmunk	A	M				5		1	2	3	
			A	M				2		5	7	4	5-9
			A	F				6		7	1	2	6-2
			A	M				7	1	1	9	1	10-2
			A	M				1		9	8	1	9-2
			A	M				8	1	4	3	1	12-2
			A	M				9	1	3	8	1	12-7
1	3	Least Chipmunk	A	M			1	0		3	6	1	3-12
			A	M			0	2		3	7	5	4-12
			A	M			1	1		4	8	1	4-1
			A	M			0	7		7	0	2	6-3
			A	M			0	1		9	8	2	9-2
		P13 of 18	A	F				6	1	2	3	3	11-3
			A	M				8	1	2	2	2	11-2

RODENTS SITE: Juniper W2-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Canyon mouse	A	F	0001	096	1	8-1
							#10
10	Cañon Mouse	A	F	0001	052	2	5-4
	↓	A	M	0002	097	1	9-1
		A	F	0007	123	1	11-3
		J	F	0001	055	1	
11	Cañon Mouse	A	M	0008	081	1	7-9
	↓	A	M	0002	097	2	9-1
		A	F	0001	098	3	9-2
		A	M	0004	144	1	12-1
12	Cañon Mouse	A	F	0001	20	4	2-5
	↓	A	F	0007	114	2	10-7
		A	M	0002	97	3	9-1
		A	M	0004	120	2	10-1
		A	M	0006	144	1	12-1
13	Cañon Mouse	A	F	01	27	5	3-3
	↓	A	F	07	119	3	10-2
		A	M	09	138	1	12-7
		J	F	01	144	2	12-1

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RODENTS SITE: Juniper WJ-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Apache pocket mouse	A	F	0006	114	1	10-7
							#10
10	Apache Pocket Mouse	A	F	0003	003	1	1-3
	↓	A	F	0009	020	1	2-5
11	Apache Pocket Mouse	A	F	0003	023	2	2-2
		A	x			X	1-4
	↓	A	F	0006	069	2	6-4
12	Apache Pocket Mouse	A	F	0003	23	3	2-2
	↓	A	F	06	115	3	10-6
13	Apache Pocket Mouse	A	F	09	4	2	1-4
	↓	A	F	03	47	4	4-2

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RODENTS SITE: Juniper WJ-1 OBSERVER: CVG + DPL MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	0	Western Harvest Mouse	A	F	0	0	0	1	0	2	9	1	3 - 5
													(3 - 3 chu

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SITE: Juniper WJ-1 OBSERVER: [illegible] MO.: 3 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
10	Golden Mantle Squirrel	A	F	0001	121	1	11-1
12	G M S	A	F	0001	45	2	4-4

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Juniper WJ-1 8 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
1	0	White Antelope Squirrel	A	X					1	3	3	1	→ Lost 12-12
				X									Snipped by WAS 4-1
1	1	W.A.S. |||	A	M	0	0	0	4	0	8	3	1	7-11

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SITE: Juniper 2 WJ2 OBSERVER: PEL MO.: 9 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
16	Deer mouse	A	m		013	1	6 snapped
	Deer mouse	A	m		016	1	
	Deer mouse	A	m		019	1	
	Deer mouse	J	F		021	1	
	Canyon mouse	A	m		024	1	
	Pinyon mouse	A	m		007	1	
	Canyon mouse	A	m		005	1	
	Desert wood rat	J	m		004	1	
	Deer mouse	A	m		003	1	
	Desert wood rat	A	F		002	1	broken tail
	Desert wood rat	A	m		001	1	[illegible]
	Pinyon mouse	A	F		008	1	
	Deer mouse	A	F		011	1	
	Pinyon mouse	A	m		012	1	
17	Pinyon mouse	A	m		013	2	19 snapped 4 [illegible]
	Deer mouse	A	m		014	1	caught foot
	Deer mouse	A	m		014	2	dead caught in door
	Deer mouse	A	F		015	1	
	Apache pocket	A	m		016	1	
	Deer mouse	A	m		017	2	
	Apache pocket	A	m		018	1	
	Deer mouse	A	m		021	1	
	Desert wood rat	J	m		022	2	

RODENTS SITE: Juniper 2° WJ-2 OBSERVER: TEK MO.: 8 YR. 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
17	Deer mouse	A	F		023	1	Continued from 4
	Desert wood rat	A	F		003	2	
	Pinyon mouse	A	m		005	2	
	Pinyon mouse	A	F		007	2	
	Bushy tailed woodrat	A	m		008	1	
	Deer mouse	A	m		009	1	
	Deer mouse	A	F		010	2	
	Desert wood rat	A	m		012	1	
	Desert wood rat	A	m		024	2	Stubbie
18	Desert wood rat	A	m		003	2	13 snapped
	Canyon mouse	A	m		005	2	
	Bushy tailed woodrat	A	m		006	2	
	Pinyon mouse	A	m		007	2	
	Deer mouse	A	F		009	2	
	Deer mouse	A	m		010	2	
	Desert wood rat	A	m		012	2	
	Deer mouse	A	m		014	2	
	Deer mouse	A	F		015	2	
	Apache pocket	A	m		016	2	
	Canyon mouse	A	F		017	1	
	Apache pocket	A	m		018	2	
	Desert wood rat	A	m		019	1	
	Deer mouse	A	F		071	1	
	[illegible]						[illegible]

RODENTS SITE: Juniper WJ-2 OBSERVER: PE MO.: 8 YR. 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
20	Deer mouse	A	m		023	2	continued from 2
	Pinyon mouse	A	m		023	1	caught legally,
	Desert wood rat	A	F		024	1	
	Desert wood rat	J	m		004	2	
	Deer mouse	A	m		005	2	
	Pinyon mouse	A	m		008	2	
	Deer mouse	A	F		009	1	
	Deer mouse	A	F		010	2	
	Pinyon mouse	A	m		011	2	
	Canyon mouse	A	F		012	1	
	END						

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ODENTS SITE: Juniper 2° WJ-2 OBSERVER: REK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
18	Desert wood rat	J	m		022	2	[illegible] from # 2
	Desert wood rat	A	m		023	1	
	Desert wood rat	A	m		024	1	
19	Desert wood rat	A	m		002	2	
	Desert wood rat	J	m		004	2	
	Pinyon mouse	A	F		005	2	
	Desert wood rat	A	m		007	2	
	Desert wood rat	A	F		008	2	
	Deer mouse	A	F		009	2	
	Pinyon mouse	A	m		010	2	
	Desert wood rat	A	m		013	2	
	Apache pocket	A	m		014	2	
	Apache pocket	A	m		018	2	
	Desert wood rat	A	m		019	2	
	Deer mouse	A	F		020	2	
	Canyon mouse	A	F		023	1	
20	Desert wood rat	A	F		013	2	#27 bait snapped.
	Deer mouse	A	F		014	2	
	Deer mouse	A	F		016	2	
	Deer mouse	A	m		017	2	
	Deer mouse	A	m		018	1	
	Desert wood rat	A	m		019	2	

ODENTS SITE: Juniper 3° WJ3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
09	Deer mouse	A	m		012	1	[illegible] 13 [illegible]
	Desert Wood rat	A	m		011	1	
	Pinyon mouse	A	F		010	1	
	Desert wood rat	A	m		009	1	
	Deer mouse	A	m		007	1	
	Deer mouse	A	F		006	1	pregnant
	Deer mouse	A	m		005	1	
	Desert wood rat	A	F		004	1	
	Deer mouse	A	m		001	1	} caught together
	Deer mouse	A	F		001	1	
	Deer mouse	A	m		024	1	
	Desert wood rat	J	F		021	1	
	Deer mouse	A	m		018	1	
	Desert wood rat	A	F		017	1	
	Deer mouse	A	m		016	1	
	Pinyon mouse	A	F		015	1	
	Desert word rat	A	m		014	1	
10	Pinyon mouse	A	F		020	2	14 snapped
	Desert wood rat	A	m		013	2	
	Least Chipmunk	A	M		015	1	
	Deer mouse	A	m		016	2	
	Desert word rat	A	F		017	2	
	Pinyon mouse	A	F		018	2	

ODENTS SITE: Juniper 3° WJ-3 OBSERVER: PCK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
10	Deer mouse	A	F		019	2	continued
	Desert wood rat	J	F		021	2	
	Deer mouse	A	m		023	2	
	Pinyon mouse	A	F		024	1	
	Dear mouse	A	F		001	2	pregnant
	Deer mouse	A	m		002	2	
	Desert wood rat	A	F		004	2	stubby --
	Deer mouse	A	m		007	2	
	Desert wood rat	A	F		008	1	
	Deer mouse	A	F		009	1	
	Deer mouse	A	F		010	1	
	Deer Mouse	J	M		011	1	
	Canyon mouse	A	F		012	1	
1	Desert wood rat	A	m		013	2	11 snapped
	Pinyon mouse	A	F		014	2	
-	Dear mouse	A	m		016	2	
	Desert wood rat	A	F		017	2	
	Desert wood rat	A	F		018	2	
	Pinyon mouse	A	F		019	2	
	Pinyon mouse	A	m		020	1	
	Pinyon mouse	A	F		020	2	caught together
	Desert wood rat	A	m		021	1	
	Least Chipmunk	A	m		022	2	

RODENTS SITE: Juniper 3° WJ3 OBSERVER: TFK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
11	Deer mouse	A	F		0 2 3	2	
	Pinyon mouse	A	F		0 2 4	1	
	Apache mouse	A	F		0 0 2	1	
	Bushy tailed woodrat	A	m		0 0 3	1	
	Desert wood rat	J	F		0 0 4	2	
	Deer mouse	A	m		0 0 5	2	
	Deer mouse	J	m		0 0 6	1	
	Deer mouse	A	m		0 0 7	2	
	Desert wood rat	A	F		0 0 9	2	
	Deer mouse	A	m		0 1 0	2	
	Canyon mouse	A	m		0 1 2	1	
12	Desert wood rat	A	m		0 1 3	2	[illegible]
	Deer mouse	J	m		0 1 4	2	3 [illegible]
	Deer mouse	A	m		0 1 5	1	
	Desert wood rat	A	F		0 1 6	2	[illegible]
	Bushy tailed woodrat	A	m		0 1 7	2	
	Pinyon mouse	A	F		0 1 8	2	
	Pinyon mouse	A	F		0 1 9	2	
	Least chipmunk	A	m		0 2 0	2	
	Desert woodrat	A	F		0 2 2	2	
	Pinyon mouse	A	F		0 2 3	2	
	Pinyon mouse	A	F		0 2 4	1	
	Deer mouse	A	m		0 1 0	2	

UENTS SITE: Juniper (3° W) OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
2	Deer mouse	A	F		007	1	[illegible]
	Deer mouse	A	F		006	2	
	Desert wood rat	J	F		005	2	
	Desert wood rat	A	F		004	2	
	Deer mouse	A	F		002	2	pregnant
	Deer mouse	A	m		001	2	
3	Pinyon mouse	A	F		013	2	[illegible]
	Pinyon mouse	A	m		014	1	
	Deer mouse	A	m		015	1	
	Pinyon mouse	A	F		016	2	
	Desert wood rat	A	F		017	2	
	Desert wood rat	A	m		018	2	
	Pinyon mouse	A	F		019	1	
	Pinyon mouse	A	F		020	2	
	Pinyon mouse	A	m		023	1	
	Deer mouse	A	F		024	2	
	Desert wood rat	A	m		010	2	
	Desert wood rat	J	F		008	2	
	Deer mouse	A	m		006	2	
	Desert woodrat	J	m		005	1	
	Desert woodrat	A	F		004	2	
	Desert woodrat	A	F		003	2	
	Deer mouse	A	m		002	1	

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG+PFK MO.: YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Deer Mouse	A	M	0020	001	1	
		A	F	0014	002	1	Preg
		A	M	0021	004	1	SA
		A	F	0022	005	1	SA
		A	M	0023	008	1	
		A	F	0024	013	1	
		A	M	0025	020	1	2-5
		A	M	0026	024	1	2-1
		A	F	0027	027	1	2-3 SA
		A	M	0028	030	1	3-6
		J	F	0029	035	1	3-11
		A	M	0030	036	1	3-12
		A	F	0047	039	1	4-10
		A	M	0001	049	1	5-1
		A	F	0048	053	1	5-5 SA
		A	M	0049	066	1	6-7
		A	F	0050	059	1	5-11 SA
		A	X	0000	081	X	7-9 Escapee
		A	F	0051	080	1	7-8
		A	F	0052	090	1	8-7
		A	F	0053	076	1	7-4
		A	M	0054	094	1	8-3
		A	M	0055	099	1	9-3
	↓	A	F	0056	112	1	10-9

RODENTS SITE: Shadscale WS-1 OBSERVE: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Deer Mouse	A	F	0057	111	1	10-10
		A	M	0058	107	1	9-11 6 traps sprung
		A	M	0059	109	1	10-12
		A	F	0060	133	1	12-12
		A	M	0061	136	1	12-9
		A	M	0062	126	1	11-6
		A	F	0063	124	1	11-4
		A	F	0064	141	1	12-4
	↓	A	M	0065	121	1	11-1
03	Deer Mouse	A	M	0020	001	2	
		A	M	0021	002	2	
		A	F	0014	004	2	
		A	M	0002	005	1	
		A	M	0066	007	1	
		A	F	0067	011	1	
		A	F	0068	016	1	2-9 2-8 [illegible]
		A	F	0022	020	2	2-5
		A	F	0069	024	1	
		A	M	0028	028	2	3-4
		A	M	0070	032	1	3-8
		A	F	0024	035	2	3-11
		A	M	0071	036	1	3-12
	↓	A	F	0050	037	2	4-12 SA

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UDENTS SITE: Shodscale WS-1 OBSERVER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
23	Deer Mouse	A	M	0030	037	2	4-12 [illegible]
		A	F	0047	039	2	4-10
		A	F	0072	044	1	4-5
		A	M	0073	045	1	4-4 4-3 [illegible]
		A	M	0074	049	1	5-1
		A	F	0075	049	1	5-1
		A	M	0076	072	1	6-1
		A	F	0027	051	2	5-3
		A	M	0026	070	2	6-3
		A	F	0048	067	2	6-6 5-9 [illegible]
		A	F	0000	063	1	6-10 [illegible]
		A	M	0077	060	1	5-12
		A	F	0057	087	2	8-10 8-11 [illegible] 8-9 "
		A	F	0051	079	2	7-7
		A	M	0049	079	2	7-7 8-5 [illegible] 7-6 [illegible]
		A	F	0053	076	2	7-4
		A	M	0078	120	1	10-1
		A	X	0000	101	X	9-5
		A	M	0061	104	2	9-8
		A	F	0079	104	1	9-8
		A	M	0062	113	2	10-8
		A	M	0081	105	1	9-9
		A	F	0080	112	1	10-9
	v	A	M	0058	107	5	9-11

ODENTS SITE: Shaftsvale WS-1 OBSERVER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
03 03	Deer Mouse	A	M	0082	109	1	10-12
		A	F	0056	133	2	12-12
		A	F	0083	136	1	12-8 shut 12-9
		A	X	0000	141	X	12·4
		J	M	0084	123	1	11-3
		A	F	0085	143	1	12·2
	↓	A	M	0065	121	2	11-1 10 traps shut
04	Deer Mouse	A	M	0020	001	3	
		A	M	0021	002	3	
		A	F	0014	003	3	
		A	M	0086	009	1	#10 [illegible]-replaced
		A	F	0067	011	2	
		A	M	0030	013	3	
		A	F	0047	014	3	Dead caught in trap dead
		J	M	0087	014	1	
		A	F	0088	015	1	Preg.
		A	M	0066	016	2	
		A	F	0068	016	2	Caught in trap door [illegible] [illegible]
		A	M	0070	018	2	
		A	M	0028	021	3	#22 [illegible] #22 [illegible] replace
		A	M	0074	025	2	#25 [illegible]
		A	M	0089	027	1	
	↓	A	M	0025	029	2	
	04 18						

RO[illegible] 15 SITE: Shadscale WS-1 OBSERVER: CVG & PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
04	Deer Mouse	A	F	0090	037	1	4-12 #31 shut [illegible]
		A	F	0072	044	2	4-5 4-11 shut
		A	F	0027	050	3	5-2
		A	F	0053	053	3	5-5
		A	F	0048	054	3	5-6
		A	F	0050	061	3	6-12
		A	F	0091	063	1	6-10 6-5 shut
		A	m	0073	070	2	6-3
		A	m	0026	071	3	6-2
		A	F	0092	074	1	7-2
		A	m	0054	095	2	8-2 5-9 shut
		A	F	0093	092	1	8-5
		A	m	0061	081	3	7-9 8-9 shut 8-10 shut
		A	m	0058	085	3	[illegible]-12 8-11 shut
		A	m	0081	107	2	9-11
		A	m	0094	110	1	10-11
		A	F	0063	100	2	9-4
		A	m	0078	121	2	11-1
		A	m	0095	144	1	12-1
		A	m	0065	122	3	11-2
		A	x	0000	122	X	11-2
		J	m	0084	123	2	11-3
		A	F	0096	139	1	12-6
	↓	A	F	0080	129	2	11-9

ODENTS SITE: Shadscale WS-1 OBSERVER: CVO + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
04	Deer Mouse 41	A	F	0056	133	3	12-12 11 traps shut
	↓						
05	Deer Mouse	A	m	0002	002	2	10 shut replaced
		A	F	0014	008	4	13 shut replaced
		A	m	0030	011	4	
		A	F	0031	013	1	Hair clipped
		J	m	0032	014	1	11
		J	m	0087	015	2	16 shut 17 shut
		A	m	0070	018	3	22 shut 23 shut
		A	X	0000	019	X	Escaped 30 shut
		A	m	0025	020	3	40 shut 46 shut
		A	F	0075	024	2	67 shut 68 shut
		A	m	0033	036	1	7-5 shut 7-6 shut
		A	F	0091	039	2	8-7 shut 8-11 replaced
		A	F	0034	041	1	10-12 shut
		A	m	0074	048	3	10-5 shut
		A	m	0026	050	4	
		A	F	0053	053	4	
		A	F	0035	071	1	
		A	F	0036	071	1	
		A	m	0076	072	2	
		A	F	0037	095	1	8-2
		A	F	0093	092	2	8-5
	↓	A	m	0077	084	2	7-12

ODENTS SITE: Shadscale WS-1 RVER: CVG + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
05	Deer Mouse	A	M	0094	085	2	8-12
	↓	A	M	0058	107	4	9-11
		A	M	0081	110	3	10-11
		A	M	0055	117	2	10-4
		A	M	0078	121	3	11-1
		A	F	0085	144	2	12-1
		A	M	0095	140	2	12-5
		A	M	0062	139	3	12-6 dead caused with trap door
		A	F	0096	139	2	12-6
		A	F	0056	136	4	12-7
	↓	A	M	0059	133	2	12-12 17 traps shut
06	Deer Mouse	A	M	0020	002	4	#3 shut 6 shut
	↓	A	M	0002	003	3	13 shut (2nd) 17 shut
		A	M	0000	007	1	43 " 42 "
		A	F	0000	008	1	5-11 " 5-12 "
		J	M	0032	010	2	8-9 shut (hole)
		A	F	0038	011	1	8-6 shut 7-5 "
		A	F	0067	014	3	10-12 "
		A	X	0000	015	X	
		A	F	0014	019	5	
		A	F	0022	021	3	
		A	M	0021	022	4	
	↓	A	F	0039	024	1	

RODENTS SITE: Shadscale WS- OBSERVER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
06	Deer Mouse	A	F	0092	025	2	
		A	m	0089	027	2	
		A	F	0034	033	2	
		A	m	0040	038	1	
		A	m	0041	048	1	
		A	m	0073	071	3	6-2
		A	F	0048	053	4	5-5
		A	F	0043	084	1	7-12
		A	m	0042	085	1	8-12
		A	F	0051	080	3	7-8
		A	m	0026	074	5	7-2
		A	X	0000	073	X	7-1
		A	m	0055	101	3	9-5
		A	m	0084	115	3	10-6
		A	F	0044	114	1	10-7
		A	m	0058	108	5	9-12
		A	m	0094	110	3	10-11
		A	F	0056	133	5	12-12
		A	F	0045	134	1	12-11
		A	m	0046	140	1	12-5
		A	m	0095	142	3	12-3
		A	m	0025	143	4	12-2
		A	F	0085	144	3	12-1
	↓	A	m	0078	121	4	11-1 12 traps Shut

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG + PEK MO.: 8 YR.: 7

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Apache Pocket Mous	A	F	0007	006	1	SA
		A	M	0001	019	1	2-6
		A	M	0003	050	1	5-2
		A	M	0008	061	1	6-12
		J	F	0009	115	1	10-6
03	Apache Pocket Mouse	A	F	0007	007	2	
		A	F	0010	021	1	2-4
		A	M	0003	050	2	5-2
		A	M	0001	053	2	5-5
		A	M	0011	064	1	6-9
		J	F	0009	115	2	10-6
		A	M	0012	139	1	12-6
04	Apache Pocket Mouse	A	M	0001	005	3	
		A	F	0010	020	2	
05	Apache Pocket Mouse	A	M	0001	005	4	
		A	F	0010	044	3	
06	Apache Pocket Mouse	A	F	0010	004	4	
		A	M	0001	029	5	
		A	M	0003	050	3	5-2
		A	M	0008	061	2	6-12
	P9 of 18	A	M	0012	141	2	12-4

ODENTS SITE: Shadscale WS-1 OBSERVER: CVG + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Ord Kangaroo Rat	A	M	0008	012	1	
		A	M	0009	119	1	10-2
		A	M	0010	103	1	9-7
		A	M	0011	110	1	10-11
	↓	A	F	0012	138	1	12-7
03	Ord Kangaroo Rat	A	M	0008	012	2	
		J	M	0013	056	1	5-8
		A	M	0010	103	2	9-7
		A	M	0014	114	1	10-7
		A	M	0011	132	2	11-12
	↓	A	M	0015	138	1	12-7
04	Ord Kangaroo Rat	A	M	0008	012	3	
		J	M	0013	056	2	5-8
		A	M	0010	080	3	7-8
	↓	A	M	0011	109	3	10-12
05	Ord Kangaroo Rat	J	M	0013	007	3	
		A	F	0016	009	1	
		A	M	0010	080	4	7-8
		A	F	0012	089	2	8-8
		A	M	0009	143	2	12-2
	↓	A	M	0015	138	2	12-7

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
05 0	Ord Kangaroo Rat	A	m	0011	132	4	1r12
06	Ord Kangaroo Rat	A	m	0008	012	4	
	↓	A	F	0016	031	2	
	↓	J	m	0013	056	4	5-8 Torpor
	↓	A	m	0010	089	5	8-8
	↓	A	m	0011	132	5	11-12
	↓	A	m	0015	137	3	12-8
	↓	A	F	0012	139	3	12-6

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ODENTS SITE: Shodscale WS-1 OBSERVER: CVG + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Desert Woodrat	A	F	0002	031	1	3-7 [illegible]
	↓	A	M	0003	067	1	6-6 " "
		J	M	0004	097	1	9-1 w/short tail
		A	F	0005	135	1	12-10 long pintail
		A	M	0006	142	1	12-3 " "
03	Desert Woodrat	A	F	0002	031	2	3-7
	↓	J	M	0004	099	2	9-3
		A	F	0005	110	2	10-11
		A	M	0007	134	1	12-11 Tumor on chin
	5 * ↓ *	A	M	0002	126	X	11-6 * *
04	Desert Woodrat	A	M	0008	017	1	
	↓	A	F	0002	041	3	4-8
	* *	A	M	0002	069	X	6-4 * *
		J	M	0004	098	3	9-2
		A	M	0006	142	2	12-3
		A	F	0005	127	3	11-7
05	Desert Woodrat	A	F	0002	031	4	
	↓	J	M	0004	094	4	8-3
		A	M	0006	142	3	12-3
		A	F	0005	126	4	11-6
	* ↓ *	A	M	0002	135	X	12-10 * *

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
05 0	Desert Woodrat	A	M	0	0	0	7	1	3	4	2	12-11
06	Desert Woodrat	A	M	0	0	0	8	0	0	9	2	
	↓	A	F	0	0	0	2	0	3	2	5	
	* *	A	F	0	0	0	2				X	6-5 * *
		J	M	0	0	0	4	1	1	9	5	10-2
		A	F	0	0	0	5	1	3	5	5	12-10

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Whitetail Antelope Sq	A	F	0017	083	1	7-11
03	Whitetail Antelope Sq	A	F	0018	023	1	2-2
		J	F	0019	071	1	6-2
		A	F	0005	095	1	8-2 Big Tits
		A	M	0020	096	1	8-1
		J	X	0000	097	X	9-1
		J	M	0021	098	1	7-2
		A	M	0022	118	1	10-3
		J	F	0023	100	1	9-4
04	Whitetail Antelope Sq	A	M	0009	035	1	
		A	M	0022	119	2	10-2
		A	M	0020	097	2	9-1
		A	F	0024	135	1	12-10
		A	M	0025	134	1	12-11
		A	F	0017	132	2	11-12
05	Whitetail Antelope Sq.	A	M	0020	103	3	9-7
		J	M	0021	115	2	10-6
		J	F	0019	098	2	9-2
		A	F	0026	120	1	10-1
		A	F	0027	123	1	11-3
		J	M	0028	141	1	12-4

ODENTS SITE: Shadscale WS-1 SERVER: CVG + PEK MO.: 8 YR.: 76

DAY		SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
0	5	Whitetail Antelope Sq.	J	M	0	0	2	9	1	2	5	1	11-5
0	6	Whitetail Antelope Sq.	A	F	0	0	3	0	0	1	6	1	
			A	M	0	0	3	1	0	3	7	1	
			J	F	0	0	3	2	0	7	2	1	6-1
			J	X	0	0	0	0	0	5	7	X	5-9
			A	F	0	0	1	7	0	8	3	3	7-11
			J	M	0	0	2	9	0	8	2	2	7-10
			A	M	0	0	2	0	1	2	0	4	10-1
			J	F	0	0	2	3	1	1	7	2	10-4
			A	M	0	0	2	2	1	2	4	3	11-4
		↓	A	F	0	0	2	7	1	2	2	2	11-2

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RODENTS SITE: Shadscale WS-1 OBSERVER: CVG + PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Desert Cottontail	A	M	0001	075	1	7-3
03	Desert Cottontail	A	M	0001	052	2	5-4
04	Desert Cottontail	A	M	0001	078	3	7-6
05	Desert Cottontail	A	M	0001	054	4	
06	Desert Cottontail	A	M	0001	067	5	6-6

RODENTS SITE: Shadscale WS-1 OBSERVER: CVG & PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
03 03	Western Harvest Mouse	A	F	0001	015	1	2-10
	↓	J	F	0002	102	1	9-6
		A	M	0003	113	1	108
06	Western Harvest Mouse	A	F	0001	034	2	

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ODENTS SITE: Shadscale WS-1 O. ER: CVG+PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
05 0	Brush Mouse	A	M	0	0	0	2	0	9	1	1	8-6

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RODENTS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Deer Mouse	A	F		002	1	SA
	Deer Mouse	A	M		005	1	SA
	Apache Pocket Mouse	A	F		008	1	SA
	Deer Mouse	A	M		009	1	
	Desert Woodrat	A	M		012	1	
	Deer Mouse	A	F		014	1	
	Deer Mouse	A	F		020	1	
	Desert Woodrat	A	M		023	1	SA
03	Desert Woodrat	A	M		001	2	
	Deer Mouse	A	M		002	1	
	Deer Mouse	A	F		003	1	SA
	Deer Mouse	A	M		004	2	SA
	Deer Mouse	A	M		005	1	SA
	Deer Mouse	A	F		006	1	SA
	Deer Mouse	A	M		008	1	
	Desert Woodrat	A	M		013	2	
	Deer Mouse	A	M		014	1	SA
	Deer Mouse	A	F		015	2	SA
	Deer Mouse	A	F		016	2	
	Deer Mouse	J	F		018	1	
	Deer Mouse	A	M		019	1	SA
	Deer Mouse	A	F		021	2	
	Deer Mouse	J	M		022	1	

DENTS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
03	Deer Mouse	A	m		24	1	
04	Desert Woodrat	A	M		001	3	
	Deer Mouse	A	F		2	2	Preg
		A	X		3	X	
		J	X		4	X	
		A	m		5	1	SA
	↓	A	m		7	2	SA
	Desert Woodrat	A	m		13	3	
	Deer Mouse	A	m		15	2	SA
		A	F		16	2	SA
		J	F		18	2	
		J	M		21	2	
		A	F		22	2	SA
		A	F		23	1	
	↓	A	F		24	2	SA
5	Desert Woodrat	A	m		1	4	
	Deer Mouse	A	F		2	2	SA
		A	m		2	2	SA
		J	F		3	1	
	↓	A	m		5	1	SA
	Desert Woodrat	A	m		12	4	
	Apache Pocket Mouse	A	F		18	2	

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ODENTS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
05 05	Deer Mouse	J	m		20	2	
		A	F		21	2	Preg
		A	F		22	1	
	↓	J	F		23	1	
06	Deer Mouse	J	X		4	X	
		A	F		5	2	Preg
	↓	A	m		6	2	SA
	Desert Woodrat	A	m		9	5	
	Apache Pocket Mouse	A	F		12	3	
	Deer Mouse	A	F		20	2	SA
		A	F		21	2	SA
	↓	A	m		23	1	SA
	Desert Woodrat	A	m		24	5	

D 3 8 3 3

DENTS SITE: Shadscale 3° WS3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #			CAP. #	COMMENTS
2	Deer mouse	A	F					1	
	Deer mouse	A	m					1	
	Deer mouse	A	F					1	
	Ord's Kangaroo Rat	A	F					1	
	Apache' pocket	A	m					1	
	Apache' pocket	A	F					1	
	Desert wood rat	J	F					1	
	Deer mouse	A	F					1	
	Deer mouse	A	m					1	
	Ord's Kangaroo	A	m					1	
	Apache' pocket	A	X					X	escapee
3	Ord's Kangaroo Rat	A	F		0	0	1	1	
	Ord's Kangaroo Rat	A	m		0	0	5	2	
	Deer mouse	A	m		0	0	6	1	
	Apache' pocket	A	m		0	0	7	1	
-	Deer mouse	A	m		0	0	8	2	
	Deer mouse	A	F		0	1	1	1	
	Ord Kangaroo Rat	A	F		0	1	4	2	
	Deer mouse	A	m		0	1	5	2	
	Apache' pocket	A	m		0	1	7	2	
	Deer mouse	A	m		0	2	0	1	
	Deer mouse	A	F		0	2	1	2	
	Deer mouse	A	F		0	2	4	2	

ODENTS SITE: Shadscale 4° W53 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
04	Ord Kangaroo Rat	A	F		014	2	13 snapped 9 snap...
	Ord Kangaroo Rat	A	M		018	2	
	Ord Kangaroo Rat	A	F		024	2	
	Deer mouse	A	F		001	1	
	Desert wood Rat	A	M		002	1	
	Deer mouse	A	M		007	1	
	Deer mouse	A	F		008	1	} caught together
	Deer mouse	A	M		008	2	
	Deer mouse	A	F		010	2	
	Deer mouse	A	M		011	1	
05	Ord Kangaroo rat	A	F		013	2	
	Deer mouse	A	F		014	1	
	Deer mouse	A	M		020	1	
	Ord Kangaroo	A	F		023	2	
	Apache pocket	A	F		001	1	
	Deer mouse	A	F		002	1	
	Ord Kangaroo rat	A	M		005	2	
	Deer mouse	A	F		007	1	
	Deer mouse	A	F		008	2	
	Deer mouse	A	F		010	2	
06	Ord Kangaroo rat	A	F		014	2	13 snapped 12 snapped
	Apache pocket	A	F		016	1	8 snapped
	Continue on # 3						Page # 2 of 3

MO.: YR.:

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
06	Deer mouse	A	m		017	2	continued form #2
	Deer mouse	A	F		018	2	
	Apache pocket	A	F		020	2	
	Ord's Kangaroorat	A	F		023	2	
	Deer mouse	A	m		024	1	
	Deer mouse	A	m		001	1	
	Deer mouse	A	X		002	2	escapee
	Deer mouse	A	F		003	1	
	Western Harvest.	A	m		003	1	
	Deer mouse	A	m		007	2	
	Apache pocket	A	m		010	2	

END

DENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 7

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
16	Deer Mouse	A	M	9	11	1	50 [illegible] 26 [illegible]
	|	A	M	10	9	1	PG
	|	A	M	11	6	1	
	|	A	F	12	24	1	PG
	|	A	M	13	20	1	
	|	A	M	14	33	1	
	|	A	F	15	32	1	
	|	A	M	16	28	1	
	|	A	M	17	25	1	
	|	A	F	18	44	1	
	|	A	X	X X X X	50	X	Escaped
	|	A	F	19	49	1	
	|	A	M	20	72	1	
	|	A	M	21	67	1	
	|	A	M	22	63	1	
	↓	A	F	23	62	1	
-							
17	Deer Mouse	A	F	15	9	2	33 [illegible] 28 [illegible]
	|	A	M	17	24	2	25 [illegible] 42 " [illegible]
	|	A	F	12	23	2	60 [illegible] 61 "
	|	A	M	24	19	1	
	|	A	F	25	33	1	SA
	|	A	F	18	32	2	
	↓	A	M	11	29	2	
	Page 1 of 9						

ODENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 7

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
7	Deer Mouse	A	m	13	26	2	
		A	F	23	59	2	
		A	M	26	50	1	
		A	F	19	49	2	
		A	M	27	72	1	
		A	m	21	69	2	
		A	m	16	67	2	
		A	F	28	64	1	
		A	m	22	63	2	
	↓	A	F	29	62	1	
8	Deer Mouse	A	F	15	09	3	6 [illegible] 13 "
		A	m	30	1	1	31 " 27 "
		A	m	31	24	1	25 " [illegible]
		A	F	12	23	3	
		A	m	17	22	3	
		A	m	13	21	3	
		A	m	11	19	3	
		A	F	18	32	3	
		A	m	16	20	3	
		A	M	9	45	2	
		A	m	27	41	2	
		A	m	32	50	1	
	↓	A	m	20	49	2	

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ODENTS SITE: Rimrock WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
18	Deer Mouse	A	F	19	72	3	
		A	F	33	69	1	
		A	m	22	64	3	
		A	m	34	63	1	
	↓	A	F	29	62	2	
19	Deer Mouse	A	m	9	9	3	[illegible] 7 [illegible]
		A	m	24	4	2	2 " 25 "
		A	m	35	3	1	2 [illegible] [illegible] "
		A	m	30	1	2	51 " 71 "
		A	m	17	24	4	
		A	m	11	19	4	
		A	F	28	33	2	
		A	m	27	32	3	
		A	F	15	31	4	
		A	m	13	26	4	
		A	F	12	25	4	
		A	m	26	46	2	
		A	m	21	44	3	
		A	F	18	42	4	
		A	m	14	56	2	
		A	F	23	55	3	
		A	m	32	50	2	
	↓	A	F	19	49	4	

ODENTS SITE: [illegible] WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
9	Deer Mouse	A	F	33	69	2	
	↓	A	M	16	67	4	
		A	M	34	64	2	
		A	M	36	63	1	
		A	M	22	63	4	
	↓	A	F	29	62	3	
10	Deer Mouse	A	M	30	4	3	9 dead [illegible] in trap
	↓	A	M	35	3	2	15 dead 25
		A	M	37	2	1	70 dead
		A	F	12	24	5	
		A	M	17	21	5	
		A	M	13	20	5	
		A	M	24	19	3	
		A	M	38	15	1	
		A	M	10	34	2	
		A	F	39	33	1	
		A	M	9	31	4	
		A	M	11	28	5	
		A	F	19	46	5	
		A	F	15	42	5	
		A	M	27	40	4	
		A	M	14	57	3	
	↓	A	M	20	50	3	
	- 4 [illegible] 9						

ODENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
20 2	Deer Mouse	A	F	40	49	1	
		A	M	32	71	3	
		A	F	41	69	1	
		A	F	33	68	3	
		A	X	—	68	X	
		A	M	16	67	5	
		A	F	28	65	3	
		A	M	34	64	3	
	↓	A	F	29	62	4	

DENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
6	Bushytail Woodrat	A	F	3	27	1	
8	Bushytail Woodrat	A	M	4	44	1	
9	Bushytail Woodrat	A	F	3	6	2	
	↓	A	F	5	23	1	
		A	M	4	29	2	
	↓	A	M	6	72	1	
10	Bushytail Woodrat	A	F	3	6	3	
	↓	A	F	5	23	2	[illegible] F [illegible] in
		A	M	4	30	3	[illegible]
	↓	A	M	6	72	2	

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ODENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
16	Brush Mouse	A	F				1		4	2	1	
17	Brush Mouse	A	F				1		4	1	2	
19	Brush Mouse	A	F				1		6	5	3	

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ODENTS SITE: [illegible] WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
17	Western Harvest Mouse	A	M	1	37	1	
		A	F	2	56	1	PG
19	Western Harvest Mouse	A	F	3	13	1	PG
		A	M	1	37	2	
20	Western Harvest Mouse	A	F	2	61	2	PG

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ODENTS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 7c

DAY	SPECIES	AGE	SEX	TOE CLIP				TRAP #			CAP. #	COMMENTS
17	Least Chipmunk	A	F				1		2	2	1	
20	Least Chipmunk	A	F				1		2	2	2	

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UENTS SITE: Kipovion WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
16 /16	Deer Mouse	A	m		2	1	
		A	F		5	1	SA
		A	F		6	1	
		A	m		7	1	
		A	m		10	1	
		A	m		12	1	
		A	F		13	1	
		A	m		14	1	
		A	F		14	1	
		A	m		15	1	
		A	F		16	1	PG
		A	m		17	1	
		A	m		18	1	SA
		A	m		22	1	SA
		A	F		23	1	
	v	A	M		23	1	
17	Deer Mouse	A	M		2	1	
		A	m		5	1	
		A	F		6	1	
		A	m		7	1	
		A	m		10	2	
		A	F		11	2	
	↓	A	m		12	2	
	Plot F						

ODENTS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
17	Deer Mouse	A	F		13	1	
		A	m		15	2	
		A	F		16	2	PG
		A	m		17	2	
		A	m		18	2	
		A	m		19	2	SA
		A	m		23	2	
	↓	A	m		24	2	
18	Deer Mouse	A	m		2	2	
	Western Harvest Mouse	A	F		3	1	PG
	Deer Mouse	A	F		4	1	
		A	F		5	1	
		A	F		6	2	
		A	F		8	1	
		A	m		9	1	
		A	m		10	2	
		A	m		11	2	
		A	F		12	2	
		A	F		13	2	
		A	F		15	2	
		A	m		16	1	
		A	F		17	1	PG
	↓	A	F		18	2	PG

UDENTS SITE: Riparian WP-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
8	Deer Mouse	A	M		19	1	
	↓	A	M		20	1	SA
	Western Harvest Mouse	A	M		22	1	
	Deer Mouse	A	M		23	2	
	↓	A	F		24	1	PG
9	Deer Mouse	A	M		2	2	
		A	M		3	1	SA
		A	F		4	2	PG
		A	M		5	2	Dead Tail caught in trap door
		A	F		6	2	
		A	M		7	1	
		A	M		8	1	
		A	X		9	~~2~~	
		A	M		10	2	
		A	F		11	2	
		A	F		12	1	
		A	M		13	2	
		A	F		15	2	PG
		A	M		16	2	
		A	F		17	2	
		A	F		18	1	
		A	M		19	2	SA
	↓	A	M		20	2	

ODENTS SITE: Riparian WR2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
19	Deer Mouse	A	M		21	2	
		A	F		21	2	
		A	M		23	2	
		A	M		24	2	
	↓	A	F		24	2	
20	Deer Mouse	A	F		2	1	
		A	M		3	2	
		A	F		4	2	
		A	M		4	2	[illegible] caught in trap door
		A	F		5	2	
		A	F		6	1	
		A	M		7	2	
		A	F		8	2	
		A	F		9	2	
		A	F		10	2	
		A	M		11	2	
		A	F		11	2	
		A	M		12	2	
	↓	A	F		13	2	
	Western Harvest Mouse	A	M		14	1	
	Deer Mouse	A	M		15	2	
		A	M		15	2	
	↓	A	M		16	2	
	[illegible]						

RODENTS SITE: [illegible] OBSERVER: CVG Mo.: 8 YR.:

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
	Deer Mouse	A	F		17	2	
		A	m		19	2	
		A	m		20	1	
	↓	A	F		20	1	
	Western Harvest Mouse	A	m		21	1	
	Deer Mouse	A	F		22	2	PG
		A	m		23	1	
	↓	A	m		24	2	

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ODENTS SITE: Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
02	Deer mouse	A	F			1	pregnant
	Deer mouse	A	F			1	
	Ord's Kangaroo Rat	A	F			1	
	Deer mouse	A	m			1	
	Deer mouse	A	m			1	
	Deer mouse	A	F			1	
	Deer mous	J	F			1	
	Deer mouse	A	F			1	
	Apache pocket.	A	m			1	
	Deer mouse	A	F			1	
	Deer mouse	A	m			1	
	Bushy tailed woodrat	A	F			1	
	Ord's Kangaroo	A	M			1	
	Deer mouse	A	F			1	
03	Deer mouse	A	F		014	2	pregnant
	Deer mouse	J	m		015	1	
	Deer mouse	A	m		017	1	
	Deer mouse	A	F		018	1	
	Deer mouse	A	F		020	2	
	Deer mouse	A	m		021	2	
	Deer mouse	A	m		022	1	
	Deer mouse	A	m		023	1	
	Ord's Kangaroo Rat	A	F		024	2	

DENTS SITE: Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
3	Deer mouse	J	F		001	2	
	Deer mouse	A	m		002	1	
	Deer mouse	A	m		003	2	
	Deer mouse	A	F		004	2	
	Deer mouse	J	F		006	1	
	Ord's Kangaroo Rat	A	m		010	2	
	Apache pocket	A	m		011	2	
	Ord's Kangaroo Rat	A	F		012	1	
4	Deer mouse	A	m		013	1	[illegible] 19 [illegible]
	Deer mouse	A	F		014	2	[illegible] pregnant
	Deer mouse	J	F		015	1	
	Deer mouse	A	m		017	2	
	Deer mouse	A	m		018	1	
	Deer mouse	A	m		020	2	
	Deer mouse	A	m		021	2	
	Ord's Kangaroo Rat	A	F		024	2	
	Deer mouse	A	F		001	1	
	Deer mouse	A	m		002	1	
	Deer mouse	A	F		004	2	
	Deer mouse	J	F		005	2	
	Deer Mouse	A	m		006	1	
	Desert wood rat	A	m		007	1	
	Deer mouse	A	m		008	1	

RODENTS SITE: Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
04	Deer mouse	A	m		010	2	continued from #2
	Ord's Kangaroo Rat	A	F		011	2	
	Deer mouse	A	m		012	1	
05	Deer mouse	A	m		013	2	#16 snapped [illegible]
	Deer mouse	A	m		014	1	[illegible] 21 [illegible]
	Deer mouse	A	m		017	2	1 sn[illegible] [illegible]
	Deer mouse	A	m		020	2	7 snapped [illegible]
	Kangaroo rat	A	F		024	2	
	Deer mouse	A	m		002	2	
	Desert wood rat	A	m		003	2	
	Deer mouse	A	F		005	2	
	Deer mouse	A	m		006	2	
	Golden-mantled sq	J	F		008	1	
	Deer mouse	A	F		010	2	
	Deer mouse	A	F		011	1	
	Ord's Kangaroo rat	A	F		012	2	
06	Deer mouse	A	F		013	1	16 snapped 7 smashed
	Deer mouse	A	m		014	2	2 – snapped 3 snapped
	Deer mouse	A	F		015	2	4 [illegible] 7 snapped & hole eaten
	Deer mouse	A	F		015	2	pregnant
	Deer mouse	A	m		018	2	
	Deer mouse	A	F		021	1	

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ODENTS SIT Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	AGE	SEX	TOE CLIP	TRAP #	CAP. #	COMMENTS
06 0	Deer mouse	J	F		023	1	Continued from #3
	Deer mouse	A	m		023	2	
	Ord's Kangaroo Rat	A	F		024	2	
	Deer mouse	A	F		001	1	
	Desert Wood Rat	A	m		002	2	
	Deer mouse	A	m		005	2	
	Deer mouse	A	F		006	1	
	Deer mouse	A	m		008	2	
	Deer mouse	A	F		009	1	
	Deer mouse	A	m		010	1	
	Deer mouse	A	F		011	1	
	Ord's Kangaroo Rat	A	m		012	2	
	END						

HERPS SITE: Greasewood [illegible] WG1 OBSERVER: PCK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	☒
09	Sagebrush lizard	0	0	1	[illegible] 0-5 mph S:1055 E:1120	
	Sagebrush lizard	0	0	1		
	Whiptail lizard	0	0	3		
10	Sagebrush lizard	0	0	1	0-5 mph partly cldy S:1110 E:1130	
	Sagebrush lizard	0	0	1		
11	Sagebrush lizard	0	0	1	[illegible] mph [illegible] S:1?30 E:[illegible]	
	Unidentified lizard	0	0	2		
	Whiptail lizard	0	0	1		
12	Sagebrush lizard	0	0	1	[illegible] S:1?20 E:[illegible]	
	Sagebrush lizard	0	0	2		
	Unidentified lizard	0	0	1		
13	Sagebrush lizard	0	0	1	10-15 mph gusty partly cldy S:1045 E:1115	
	↓	0	0	1		
	End					

ERPS SITE: Greasewood WG-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS		☒
09 09	NONE				2% Cld Cvr Breeze	S 1126 E 1138	
10	Western Whiptail	0	0	1	40% Cld Cvr Breeze	S 1100 E 1111	
11	Side-blotched Lizard	0	0	1	20% Cld Cvr Breeze	S 1102 E 1114	
	Sagebrush Lizard	0	0	1			
12	Sagebrush Lizard	0	0	1	0% Cld Cvr Breeze	S 1143 E 1153	
	Sagebrush Lizard	0	0	1			
13	Sagebrush Lizard	0	0	1	60% Cld Cvr Windy	S 1038 E 1047	

HERPS SITE: Greasewood 3 WG3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	☒
16	Sagebrush lizard	0	0	1	5-10 mph S:1000 partly cldy F:1025	
	Unidentified lizard	0	0	5		
17	NONE				partly cldy S:1000 [illegible] mph F:1022	
18	Sagebrush lizard	0	0	1	[illegible] 1000 [illegible]	
	〃	0	0	1		
19	Side-blotched lizard	0	0	1	10-15 mph gusts S:1000 [illegible] F:1030	
	↓	0	0	1	〃	
	↓	0	0	1	〃	
20	Sagebrush lizard	0	0	1	5-10 mph S:1000 [illegible] F:1025	
	END					

HERPS SITE: Juniper WJ-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY		SPECIES	DIST. (m)			COMMENTS		☒
0	9	Tree Lizard	0	0	2	1%cld Cvr Breeze	S 1031 E 1102	
		Sagebrush Lizard	0	0	2			
		↓	0	0	1			
		↓	0	0	1			
		Tree Lizard	0	0	1			
		↓	0	0	1			
		↓	0	0	1			
		Sagebrush Lizard	0	0	1			
		Side-blotched Lizard	0	0	1			
		Northern Plateau Lizard	0	0	1			
1	0	Side-Blotched Lizard	0	0	1	40%Cld Cvr Breeze	S 1021 E 1044	
		↓	0	0	1			
		Sagebrush Lizard	0	0	1			
		Tree Lizard	0	0	1			
1	1	Sagebrush Lizard	0	0	1	20% Cld Cvr Breeze	S 1018 E 1043	
			0	0	1			
		↓	0	0	1			
1	2	Side-blotched lizard	0	0	1	0% Cld Cvr Breeze	S 1059 E 1124	
		↓	0	0	2			
		Sagebrush lizard	0	0	2			
		Side-blotched lizard	0	0	1			

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HERPS SITE: Juniper WJ-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY		SPECIES	DIST. (m)			COMMENTS	☒
1	2	Western Whiptail	0	0	1		
		Northern Plateau Lizard	0	0	1		
		Side-blotched Lizard	0	0	1		
1	3	Northern Plateau Lizard	0	0	1	30% Cld Cvr S 1010 [illegible] E 1025	
		Side-blotched Lizard	0	0	1		
		Sagebrush Lizard	0	0	1		
		Northern Plateau Lizard	0	0	1		
		Side-blotched Lizard	0	0	1		
		Sagebrush Lizard	0	0	1		

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HERPS SITE: Juniper 2° WJ2 OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	DIST. (m)			COMMENTS	☒
1	6	Sagebrush lizard	0	0	1	5-10 mph partly cloudy S:1045 E:1110	
		↓	0	0	1		
			0	0	7		
			0	0	1		
			0	0	1		
		↓	0	0	2		
		Side-blotched lizard	0	0	1	juvenile	
1	7	Side-blotched juvenile	0	0	1	5-10 mph [illegible] S:1035 E:1055	
		Sagebrush	0	0	1		
1	8	Side-blotched lizard	0	0	1	[illegible] S:1045 E:1105	
1	8	Side-blotched lizard	0	0	1		
		Whiptail lizard	0	0	1		
		Whiptail lizard	0	0	1		
		Sagebrush lizard	0	0	2		
		Sagebrush lizard	0	0	1		
1	9	Sagebrush lizard	0	0	1	Partly cloudy 10-15 mph S:1045 E:1110	
		↓	0	0	1		
		Side-blotched lizard	0	0	1	juvenile	
2	0	Sagebrush lizard	0	0	1	0-5 mph clear S:1040 E:1105	
		↓	0	0	1		

HERPS SITE: Juniper 2 W12 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	X
20	Sagebrush lizard	0	0	2	continued from #1	
	↓	0	0	1		
	Unidentified juv. lizard	0	0	1		
	END					

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HERPS SITE: Juniper 3° WJ3° OBSERVER: PFK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	☒
09	Side-blotched lizard	0	0	1	0-5 mph s:1020 clear e:1040	
	Side-blotched lizard	0	0	1	juvenile	
	Sagebrush lizard	0	0	2		
	Side-blotched lizard	0	0	1	juvenile	
	Whiptail lizard	0	0	1		
10	Sagebrush lizard	0	0	1	0-5 mph s:1035 partly cloudy e:1055	
	Side-blotched lizard	0	0	1		
	Sagebrush lizard	0	0	2		
	Side-blotched lizard	0	0	1		
11	Sagebrush Lizard	0	0	1	0-5 mph s:1025 partly cloudy e:1045	
11		0	0	1	juvenile	
		0	0	2		
		0	0	3		
		0	0	1		
		0	0	1		
		0	0	1		
	Northern Plateau lizard	0	0	1		
12	Sagebrush lizard	0	0	1	0-5 mph s:1045 clear e:1105	
		0	0	1		
		0	0	2		
		0	0	3		
	cont. on page #2				page # 1 of 2	

HERPS SITE: Juniper 3° WS3 OBSERVER: PCK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	☒
17 12	Side-blotched lizard	0	0	1	Caught [illegible] from [illegible]	
	↓	0	0	1	juniper 10 [illegible]	
13	Sagebrush lizard	0	0	2	10-15 mph gusty partly cloudy	S: 1010 E: 1022
	↓	0	0	1		
	↓	0	0	1		
	Unidenified lizard	0	0	3		
	END					

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HERPS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS	☒
02	Sagebrush Lizard	001	40% Cld Cover Breeze	
	↓	001	S 1037 E 1105	
03	Sagebrush Lizard	001	10% Cld Cvr Breeze S 1057 E 1122	
	Desert Short-horned Lizard	001	Grnd Dry	
04	NONE		5% Cld Cvr Breeze S 1038 E 1105	
			Grnd Slightly Wet	
05	Sagebrush Lizard	001	0% Cld Cv. Breeze S 1038 E 1103	
	↓	001	1" long	
		001		
06	Sagebrush Lizard	001	0% Cld Cvr Windy S 1052 E 1115	

HERPS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)			COMMENTS		☒
02	Sagebrush Lizard	0	0	1	30% Cld Cover Breeze	S 1119 E 1130	
	↓	0	0	1			
03	Sagebrush Lizard	0	0	1	20% Cld Cvr Grnd Dry	S 1130 E 1143	
	↓	0	0	2			
04	Sagebrush Lizard	0	0	1	10% Cld Cvr Breeze Grnd Slightly Wet	S 1114 E 1126	
05	Desert Short-horned Lizard	0	0	1	0% Cld Cvr Breeze	S 1112 E 1124	
	Sagebrush Lizard	0	0	1			
06	NONE				0% Cld Cvr Windy	S 1123 E 1133	

HERPS SITE: Shadscale 3° WS3° OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	☒
02	Sagebrush lizard	0	0	1	5-10mph [illegible] S:1145 E:1210	
	Sagebrush lizard	0	0	1		
03	Sagebrush lizard	0	0	2	0-5 mph [illegible] S:1200 E 1220	
04	Sagebrush lizard	0	0	1	[illegible]	
	↓	0	0	1		
		0	0	2		
		0	0	1		
		0	0	3		
0[illegible]	Sagebrush lizard	0	0	1	[illegible] mph S:1135	
	↓	0	0	1		
		0	0	2		
06	Sagebrush lizard	0	0	1	15-20 mph gusty S:1155 Clear E:1215	
	END					

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HERPS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS	X
16	NONE		20% Cld Cvr Breeze S 1022 E 1040	
17	NONE		75% Cld Cvr Windy S 1106 E 1124	
18	NONE		10% Cld Cvr Windy S 1011 E 1029	
19	NONE		10% Cld Cvr Windy S 1011 E 1027	
20	NONE		10% Cld Cvr S 1031 E 1044	

HERPS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	X
16	Desert Striped Whipsnake	0	0	1	2% Cld Cvr Breeze to windy S 1105 E 1125	
17	Tree Lizard	0	0	1	75% Cld Cvr S 1144 Windy E 1202	
18	Northern Plateau Lizard	0	0	1	20% Cld Cvr S 1051 Windy E [illegible]7	
19	Western Whiptail	0	0	1	5% Cld Cvr S 1042 windy E 1058	
	Northern Plateau Lizard	0	0	1		
	Lizard	0	0	1		
20	Western Whiptail	0	0	1	10% Cld Cvr S [illegible] E [illegible]	

HERPS SITE: Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	DIST. (m)			COMMENTS	☒
0	2	Sagebrush lizard	0	0	1	5-10 mph partly cloudy S:1100 F:1125	
		Sagebrush lizard	0	0	3		
		Sage brush lizard ↓	0	0	2		
0	3	Side-blotched lizard	0	0	3	0-5 mph [illegible] S:1110 F:1140	
		Sage-brush "	0	0	1		
		↓	0	0	1		
0	4	Sagebrush lizard	0	0	1	[illegible]	
		lizard	0	0	2		
		S ↓	0	0	1		
		Northern Plateau	0	0	3		
0	5	Northern Plateau	0	0	1	[illegible]	
		↓	0	0	3		
		Sagebrush lizard	0	0	1		
			0	0	2		
			0	0	1		
			0	0	3		
			0	0	1		
			0	0	3		
		↓	0	0	1		
			~~0~~				
0	6	Northern Plateau	0	0	3	10-15 mph gusty S:1115 clear S:1137	
		END				page 1 of 1	

MAMMALS SITE: Greasewood II: W61 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
09	Desert Cottontail	001	0-5 mph partly cldy S.2007 E 2040
	↓	012	
	↓	100	
10	Desert Cottontail	065	partly cldy 5-10 mph S:1905 E:1937
	↓	001	
	↓	025	
	↓	001	
	↓	003	
	Mule deer	100	
	mule deer	100	
11	Desert Cottontail	001	10-15 mph partly cldy S:1920 E:1942
	↓	005	thunderstorm approaching
	↓	035	
	↓	015	
	↓	001	
12	Mule deer	200	partly cldy 5-10 mph
	Mule deer	200	
	Desert Cottontail	005	
	↓	025	
	↓	010	
	↓	001	

MAMMALS SITE: Greasewood 1°WG OBSERVER: PEK MO.: 8 YR.: 76

DAY		SPECIES	DIST. (m)			COMMENTS
1	2	Desert Cottontail	0	0	2	continued from #1
		↓	0	0	1	
1	3	Desart Cottontail	0	0	2	0-5 mph S:2020 E:2075
		↓	0	0	1	

MAMMALS SITE: Greasewood WG-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
0 9	Desert Cottontail	030	15% Cld Cvr Breeze S 1956 E 2012
	↓	003	
		007	
		010	
		010	
	↓	001	
10	Desert Cottontail	002	60% Cld Cvr Thndr Storm Activity S 1950 E 2005
	↓	015	Windy
		005	
	↓	001	
11	Desert Cottontail	060	70% Cld Cvr Thndr Storm Act. S 2002 E 2014
	↓	020	Windy Occ. Rainfall
	↓	002	
	Bat (Myotis)	001	
12	Desert Cottontail	002	5% Cld Cvr Windy S 1953 E 2004
	↓	001	
13	Whitetail Antelope Squirrel	020	30% Cld Cvr Breeze S 1934 E 1952

MAMMALS SITE: Greasewood 3° WG3 OBSERVER: PFK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)			COMMENTS	
16	Desert Cottontail	0	1	5	5-10 mph partly cld	1940 - 2005
		0	2	5		
		0	0	3		
		0	0	1		
		0	1	0		
		0	4	5		
		0	3	0		
		0	0	5		
		0	0	1		
	Bat	0	0	1	[illegible]	
	Bat	0	0	1	[illegible]	
17	Desert Cottontail	0	1	5	[illegible]	[illegible]
		0	3	0		
		0	4	5		
		0	0	1		
		0	0	5		
		0	1	5		
		0	5	0		
		0	0	3		
		0	1	0		
		0	0	1		
	Whitetail Antelope Squirrel	0	2	5		

MAMMALS SITE: Greasewood 3WG3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
18	Desert Cottontail	005	10-15 mph partly cloudy S:1900 E:1920
		010	
		001	
		050	
		015	
		020	
		065	
		001	
		001	
		001	
		030	
		025	
		010	
		040	
	↓	005	
19	Bat [myotis]	001	0-5 mph partly cloudy S:1955 E:2017
	Desert Cottontail	002	
		020	
		030	
		015	
		025	
		001	
	↓	005	

MAMMALS SITE: [illegible] W6-3 OBSERVER: PFK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
19	Desert Cottontail	045	continued [illegible]
	↓	055	
		015	
		001	
		010	
	↓	020	
20	Desert Cottontail	001	partly cloudy 0-5 mph s: 2005 e: 2030
	↓	001	
		010	
		030	
		001	
		007	
		001	
		010	
		025	} seen together
		025	
		055	
		075	
	↓	001	
	Bat (Myotis)	001	
	↓	001	
	END		

MAMMALS SITE: Juniper WJ-1 OBSERVER: CVG MO.: 8 YR.: 7

DAY	SPECIES	DIST. (m)	COMMENTS
09	Desert Cottontail	001	15% Cld Cvr S 1913 Breeze E 1939
		007	
		045	
		035	
		005	
		060	
		005	
		005	
		006	
		030	
		002	
	↓	007	
10	Desert Cottontail	010	80% Cld Cvr S 1908 Thndr Storm Activity E 1932
		010	wind
		010	
		001	
		040	
		025	
		003	
		035	
		020	
		025	
	↓	020	

MAMMALS SITE: Juniper WJ-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
1 1	Desert Cottontail	010	8[illegible]% Cld Cvr Thunderstorm Act, S 1923 E 1945
	↓	010	Windy Occ. Rainfall
		060	
		050	
		050	
	↓	040	
1 2	Desert Cottontail	001	5% Cld Cvr windy S 1911 E 1935
	↓	002	
		007	
		020	
		010	
		010	
		008	
		004	
		001	
	↓	010	
1 3	NONE		30% Cld Cvr Breeze S 2016 E 2036

MAMMALS SITE: Juniper 2° WI2 OBSERVER: PFK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
16	Desert Cottontail	005	0-5 mph partly cldy	s: 2015 e: 2035
	↓	001	
	↓	025	
17	Desert Cottontail	005	[illegible] s: 1940 e: [illegible]
18	Desert Cottontail	035	partly cldy 0-5 mph s: 1950 e: 2012
	↓	010	
19	Desert Cottontail	001	0-5 mph [illegible] s: 1925 e: [illegible]
	↓	030	
	↓	050	
20	Desert Cottontail	002	0-5 mph partly cldy s: 1930 e: 1950
	↓	035	
	END		

MAMMALS SITE: Juniper 3° WJ3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
09 09	Desert Cottontail	001	0-5 mph partly cloudy S: 1930 E: 1952
	↓	025	
		010	
		005	
	↓	030	
	Least Chipmunk	040	
10	Desert Cottontail	045	0-5 mph partly cloudy S: 1955 E: 2015
	↓	001	
	↓	010	
11	Desert Cottontail	045	5-10 mph partly cloudy S: 2000 E: 2020
11	↓	015	thunderstorm approaching
	↓	001	
12	Desert Cottontail	030	5-10 mph partly cloudy S: 1955 E: 2015
	↓	045	
		001	
	↓	010	
13	Desert Cottontail	001	[illegible] S: 19[illegible] E: 20[illegible]
	↓	007	
		005	
	↓	025	

MAMMALS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS	
02	Desert Cottontail	010	60% Cld Cover Thunder Storm's all around area	S 1845 E 1911
	Whitetail Antelope Squirrel	010		
	Desert Cottontail	005		
		003		
		012		
		010		
		050		
		060		
		040		
	↓	020		
03				
03	Desert Cottontail	035	50% Cld Cvr Thunderstorm Activity	S 1700 E 1926
		001		
		010		
		004		
		020		
	↓	003		
04	Desert Cottontail	016	40% Cld Cvr Windy	S 1857 E 1919
		025		
		005		
		010		
	↓	003		
	Whitetail Antelope Squirrel	012	Together	

MAMMALS SITE: Shadscale WS-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)			COMMENTS
04	Whitetail Antelope Squirrel	0	1	2	
	↓	0	1	2	
05	Desert Cottontail	0	2	5	0% Cld Cvr Windy S 1908 E 1931
		0	0	5	
		0	2	0	
		0	0	1	
	↓	0	5	0	
	Whitetail Antelope Squirrel	0	1	2	
		0	1	5	
		0	1	2	
	↓	0	1	2	
06	Desert Cottontail	0	1	5	0% Cld Cvr Windy S 1954 E 2014

MAMMALS SITE: Shadscale WS-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS	
02	NONE		60% Cld Cvr Thunderstorm activity	S 1927 E 1941
03	Desert Woodrat	001	50% Cld Cvr Thunderstorm Activity	S 1936 E 1946
	Bat (myotis)	001		
	Desert Cottontail	007		
04	Desert Woodrat	001	40% Cld Cvr Windy	S 1927 E 1939
	Desert Cottontail	003		
05	Desert Woodrat	001	0% Cld Cvr Windy	S 1940 E 1951
	Desert Cottontail	007		
	↓	002		
06	NONE		0% Cld Cvr Windy	S 2023 E 2031

MAMMALS SITE: Shadscale 3° WS3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
02	Desert Cottontail	025	0-5 mph [illegible] S:2000 E:2023
	↓	003	
		001	juvenile
03	Desert Cottontail	001	[illegible] S:2000 E:2020
	↓	002	
		001	
		015	
04	Desert Cottontail	001	[illegible]
	↓	001	
		005	
05	Desert Cottontail	025	0-10 mph clear S:2010 E:2030
	↓	001	
		005	
		007	
		001	
06	Desert Cottontail	001	[illegible] S:2035
	↓	005	
	END		

MAMMALS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
16	Mule Deer	080	doe [illegible] [illegible] Windy S 1942 E 1957
	Desert Cottontail	001	
	↓	001	
	Cow (Hereford)	040	
	Cow	040	
	Cow	040	
	Calf	040	
	Calf	040	
	Calf	040	
	Calf	040	
	Cow	080	
	Calf	080	
	Bat (Myotis?)	001	
17	Cow	015	[illegible] S 1903 E 1921
	Cow	003	
	Cow	060	
	↓	060	
		060	
		060	
		060	
	Steer	040	
	Calf	025	
	↓	060	

MAMMALS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
17	Desert Cottontail	005	
	↓	003	
18	Mule Deer	005	1010 Clear [illegible] → [illegible] Windy, to Calm S 1912 E 1935
	Mule Deer	005	[illegible]
	Desert Cottontail	001	Dead Being carried by a Cooper's Hawk
	↓	001	
		003	
		001	
		001	
		002	
	Calf	050	
	Beaver	060	
19	Desert Cottontail	003	[illegible] S 1414 E 1934
	↓	001	
		015	
		005	
	Cow	030	
	Beaver	060	
	Bat	001	
20	Beaver	030	[illegible] S 1944 E 2002
	↓	025	

MAMMALS SITE: Riparian WR-1 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
20 20	Desert Cottontail	001	
	↓	005	
	Bat (Myotis size)	030	
	↓	020	
	Bull	040	
	↓	040	

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MAMMALS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS	
16	Bat (large	001	Dark almost Breeze	S 2039 E 2052
	(myotis)	020		
	(large)	040		
	(myotis?)	001		
		005		
		002		
	↓ ↓	001		
	Desert Cottontail	00E		
	Cow	040		
	Calf	040		
	Calf	040		
	Beaver	002		
17	Cow	020	100% Cld Cvr Windy	S 2005 E 2024
	Calf	015		
	↓	020		
	Bat (Myotis size)	020		
		010		
		005		
		001		
		002		
	↓	001		
	Desert Cottontail	001		

P. 1 of 3

MAMMALS SITE: Riparian WR-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
18	Bat (Myotis size)	070	0% Cld Cvr Calm S 2018 E 2039
	↓	010	
		030	
		001	
		002	
		007	
		015	
	Mule Deer	060	
	Desert Cottontail	003	
	↓	005	
		001	
		002	
19	Bat (Myotis size)	030	10% Cld Cvr Breeze S 2016 E 2035
	↓	001	
		005	
		003	
		020	
		001	
		010	
	Desert Cottontail	004	
	↓	003	
		020	
		050	

MAMMALS SITE: Riparian W R-2 OBSERVER: CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
20	Bat (Myotis size)	040	[illegible] S2022 E2046
		001	
		020	
		050	
		015	
		020	
		030	
	Desert Cottontail	005	
		007	
		001	
		002	
		010	
		010	
		003	
		035	
		004	
	Porcupine	010	
	Cow	002	
		005	
	Mule Deer	001	

P3 of 3

MAMMALS SITE: Riparian 3° WR3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST. (m)	COMMENTS
02	Desert Cottontail	015	0-5 mph [illegible] 1965 [illegible] 1935
		003	
		025	[illegible]
		025	
		005	
		004	
		045	
		030	
		030	[illegible]
		015	
	Desert Wood Rat	025	
03	Desert Cottontail	035	[illegible] 1915 [illegible]
		015	
		001	
		045	
		010	
		007	
		055	
04	Desert Cottontail	001	[illegible] 1915 1940
		005	
		001	
		007	

MAMMALS SITE: Riparian WR 3 OBSERVER: P[illegible] MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
04	Desert Cottontail	005	[illegible]
	↓	015	
		015	[illegible]
		045	
		075	
		030	
		002	
		001	
05	Desert Cottontail	003	[illegible] :1925 [illegible] :1950
	↓	001	
		001	
		005	
		012	
		045	
		040	
		020	
		030	
		002	
06	Desert Cottontail	001	[illegible] :2000 [illegible] :2020
	↓	005	
		015	
		030	

MAMMALS SITE: Riparian 3 · W.R3 OBSERVER: PEK MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)			COMMENTS
06	Desert Cottontail	0	0	1	continued from #2
	↓	0	4	5	
		0	1	0	
	END				

MAMMALS SITE: Asphalt Wash Gas Pond OBSERVER: PEK + CVG MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
22	California Myotis		2033 Forearm 1.25 in. tragus-spike
	Western Pipistrel		2040 Forearm 1.3 in tragus-blunt ticks
	Western Pipistrel		2115 Forearm 1.25 in tragus blunt
	Western Pipistrel		2115 Forearm 1.3 in ♂ tragus blunt ticks
	Western Pipistrel		2125 Forearm 1.2 in tragus blunt
	Pallid Bat		2238 Forearm 2.0 in ♂
	Long-legged Myotis		2238 Forearm 1.5 in ears short [illegible] ♀
	Long-eared Myotis		2238 Forearm 1.6 in tragus spike ♂
	Yuma Myotis		2238 Forearm 1.2 in tragus spike ♂
	Hoary Bat		2259 Forearm 2.4 in ♂
	Western Pipistrel		2259 Forearm 1.3 in ♀
	Hoary Bat		2330 ♀
23	Western Pipistrel		2043 Forearm 1.25" Tragus blunt ♂
	Little Brown Myotis		2043 ♂
	Western Pipistrel		2043 Forearm 1.2 Tragus blunt ♀
	Long-eared Myotis		2120 Forearm 1.5" Tragus pointed
	Yuma Myotis		2145 Forearm 1.25 Tragus pointed ♂
	Pallid Bat		2215 Forearm 2.6" ♀
	Western Pipistrel		2215 Forearm 1.2" ♀
	Western Pipistrel		2215 Forearm 1.2 ♀
	Western Pipistrel		2235 Forearm 1.25 ♂
	Little Brown Myotis		2240 Forearm 1.6" ♂
	P1 of 2		

MAMMALS SITE: Asphalt Wash Gas Pond OBSERVER: PEV + CVC MO.: 8 YR.: 76

DAY	SPECIES	DIST.(m)	COMMENTS
23	Yuma Myotis		2332 Forearm 1.25" ♂
	Little Brown Myotis		2425 Forearm 1.5" ♀
	Western Pipistrel		2425 ♂
24	Site: White River NONE		
25	Site: Pond N. of Bonanza Western Pipistrel		2110 1.25" Forearm Tragus blunt ♀
	California Myotis		2230 1.25" + Forearm ♀
	Site: Asphalt Wash Gas Pond		
26	Little Brown Myotis		2055 ♂
	Little Brown Myotis		2202 ♂
	Little Brown Myotis		2313 ♀
	Western Pipistrel		2330 ♂
	California Myotis		2351 ♀
	Long-eared Myotis		2355 ♀
	Unidentified		2407 ♀
	Long-eared Myotis		2432 ♀
	Little Brown Myotis		0102 ♀
	Little Brown Myotis		0200 ♂

2 of 2

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
6/3	Under Evacuation pipeline on White River. Riparian	Radio	.06	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	MBER & CLASSIFICATION	COMMENTS
7/12	Under Evacuation pipeline crossing. Riparian.	Radio	.06	
	Around A-11 (poor fix) Juniper-sage.	Radio	.17	
7/13	1/4 mile NE of F-5. Riparian.	Radio	.09 + 2 fawns	Twin fawns 8 p.m.
	"	"	.09	10 p.m.
	"	"	"	12 Midnight
	"	"	"	2 a.m. couldn't locate
7/13	1/4 mile NE of F-5. Riparian.	Radio	.09	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
7/19	1/2 mile E of S-4. ?	Radio	.17	Lost signal in canyons.
	1 mile above Evacuation pipeline crossing. Riparian	Radio	.06	
7/26	1/2 mile N. of F-5. Riparian.	Radio	.09	
	1/2 mile above Evacuation pipeline crossing. Riparian.	Radio	.06	
	X-2. Riparian	Radio	.17	
7/29	1/2 mile above Evacuation pipeline crossing. Riparian	Radio	.06	
7/30	1/2 mile above Evacuation pipeline crossing. Riparian	Radio	.06	5 p.m.

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
7/30	1/2 mile above Evacuation pipeline Crossing Riparian.	Radio	.06	9 p.m.
	Under pipeline	"	"	11 p.m.
	"	"	"	3 a.m.
8/13	1/2 mile upstream from Evacuation pipeline crossing. Riparian	Radio	.06	
	1/4 mile West of S-4. Shadscale-sage.	Radio	.17	
8/14	1/4 mile NE of F-5. Riparian.	Radio	.09	
	1/4 mile NE of F-5. Shadscale-sage	Radio	.09	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
8/14	1/4 mile SW of X-2. Riparian	Radio	.17	
8/16	1/2 mile N. of F-5. Riparian	Radio	.09	
	1/8 mile N. of X-2. Riparian	Radio	.17	
8/18	1/2 mile S. of X-2. Sage-shadscale	Radio	.17	
	Under Evacuation pipeline crossing. Riparian.	Radio	.06	Poor signal
8/20	1/4 mile south of S-4. Riparian	Radio	.17	
	Under Evacuation pipeline Riparian	Radio	.06	Poor signal

DATE	LOCATION AND EGETATION TYPE	SIGHTING TYPE	BER & CLASSIFICATION	COMMENTS
8/22	Under Evacuation pipeline Riparian	Radio	.06	Poor signal 10 p.m.
	"	"	"	" 12 Mid.
	"	"	"	" 2 a.m.

6/2	1/8 mile NW of A-6. Shadscale-sage.	Ocular	3 bucks 2 - 2 pt. 1 - 4 pt.	
	HE - 3 Juniper-sage	Ocular	2 does	
	1/4 mile NE of F-5. Riparian	Ocular	Red collared doe (.09) + 2 other does.	
	1/2 mile NE of F-5. Sage-shadscale	Ocular	1 buck 3 does	
	1 mile NE of F-5. Riparian	Ocular	3 does	
6/3	Mouth of Evacuation Creek. Riparian	Ocular	4 does 2 fawns	
	Ignacio Riparian	Ocular	1 doe	

6/3	1/4 mile upstream from mouth of Evacuation Creek. Riparian	Ocular	1 doe	
	1/4 mile NE of A-7. Sage-shadscale	Ocular	1 buck - 2 pt. 1 doe	
	1/2 mile S. of A-7. Sage-shadscale	Ocular	3 unclassified	
6/7	X-2 Riparian	Ocular	2 bucks	
6/9	Ignacio X-2 Riparian	Ocular	5 does	
	1 mile W of X-2. Riparian	Ocular	2 does	
6/17	1/4 mile NE of G-17. Riparian	Ocular	1 doe 2 fawns	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
6/17	X-2 Riparian	Ocular	1 doe and 1 fawn 2 does	
6/18	1/2 mile N of F-3. Sage-shadscale	Ocular	2 does	
	A-6 Sage-shadscale	Ocular	2 bucks	
	1 mile W. of X-2. Riparian	Ocular	1 doe	
	1/4 mile S. of S-4. Riparian	Ocular	1 doe	
	1/4 mile NE of F-5. Riparian	Ocular	2 does	
6/29	Ignacio Riparian	Ocular	1 doe 1 fawn	

DATE	LOCATION AND EGETATION TYPE	SIGHTING TYPE	MBER & CLASSIFICATION	COMMENTS
6/29	Evacuation pipeline crossing on White River. Riparian	Ocular	1 doe - white collar 1 fawn	
	1/8 mile S. of A-10. Riparian	Ocular	2 does	
	1 mile N - NE of F-5. Riparian	Ocular	2 unclassified	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	MBER & CLASSIFICATION	COMMENTS
7/13	A-11. Juniper-sage	Ocular	1 buck - 4 pt.	
	PP-7. Juniper-sage	Ocular	1 buck - spike 1 doe	
7/19	F-2. Riparian	Ocular	1 doe and 1 fawn 2 unclassified	
	1 mile E. of F-5. Riparian	Ocular	3 does 1 fawn	
	G-8. Evacuation. Riparian	Ocular	3 does	
	1/4 mile NE of X-2. Riparian	Ocular	2 does	
	1/4 mile S. of S-4. Riparian	Ocular	1 doe 1 fawn	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
7/23	PP-11 Riparian	Ocular	2 does - 1 spike buck 1 fawn	
	PP-13 Riparian	Ocular	2 does 2 unclassified	
	1/4 mile N. of X-2. Riparian	Ocular	2 does	
7/27	Ignacio - X-2 Riparian	Ocular	2 does	
	X-2 - S-4. Riparian	Ocular	3 does 1 unclassified	
7/29	HE-1 Sage-shadscale	Ocular	2 does 1 buck	
	A-11. Juniper-sage	Ocular	1 buck - 2 pt.	

DATE	LOCATION AND EGETATION TYPE	SIGHTING TYPE	MBER & CLASSIFICATION	COMMENTS
7/29	1/2 mile NW of S-4. Riparian	Ocular	3 does 1 fawn	
7/30	Ignacio Riparian	Ocular	3 unclassified	

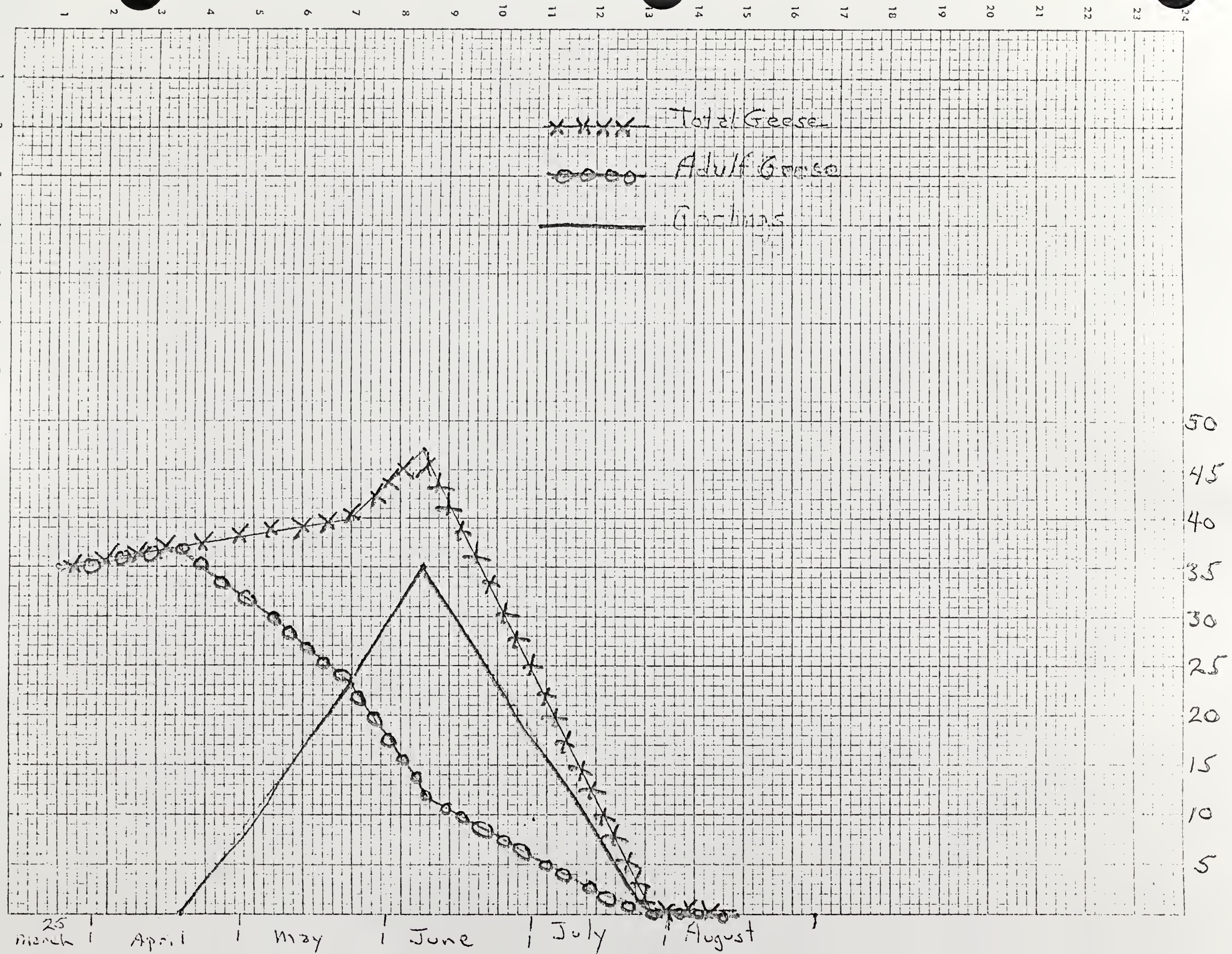
DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
8/3	F-2 Riparian	Ocular	2 does 1 fawn	
	Mouth of Evacuation Creek. Riparian	Ocular	3 does 2 unclassified	
	1 mile W. of X-2. Riparian	Ocular	1 doe 1 fawn	
	1/8 mile N. of X-4. Sage-shadscale	Ocular	1 buck - 3 pt.	
8/5	1/4 mile N. of A-11. Juniper-sage	Ocular	2 does 1 buck	
	1/4 mile NE of A-7. Sage-shadscale	Ocular	1 buck - 2 pt.	
	1/2 mile NW of A-7. Sage-shadscale	Ocular	2 does 1 fawn	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
8/14	A-11. Juniper-sage	Ocular	3 unclassified	
8/15	Ignacio - X-2 Riparian	Ocular	3 does	
	X-2 - S-4.	Ocular	4 does	
8/16	1 mile N. of F-5. Sage-shadscale	Ocular	2 does 2 fawns	
8/18	Mouth of Evacuation Creek to G-8. Riparian	Ocular	5 does 3 fawns 1 buck - 2 pt.	
	1/2 mile S. of VR-5. Riparian	Ocular	3 does 2 fawns	
8/19	X-2 Riparian	Ocular	5 does 2 fawns 2 unclassified	

DATE	LOCATION AND VEGETATION TYPE	SIGHTING TYPE	NUMBER & CLASSIFICATION	COMMENTS
8/19	1/2 mile S. of X-2. Sage-shadscale	Ocular	2 bucks (1 spike + 1 - 2pt. 2 unclassified	
8/22	Ignacio	Ocular	1 doe 1 buck - 2 pt.	
8/26	1/8 mile W. of A-6. Sage-shadscale	Ocular	1 spike buck 1 2 pt. buck	
	HE-1 Sage-shadscale	Ocular	1 doe	
	A-4. Juniper-sage	Ocular	2 does 1 buck	
8/27	F-5. Riparian	Ocular	3 does 2 fawns	
	1/4 mile SW of F-5. Riparian	Ocular	1 doe 1 fawn	

DATE	LOCATION AND EGETATION TYPE	SIGHTING TYPE	MBER & CLASSIFICATION	COMMENTS
8/27	X-1 Sage-shadscale	Ocular	1 buck - 2 pt. 1 unclassified	

Canada Goose Populations



Page 1 ble 7 Title on right

EGETATION TYPE	Reptile & Amphibian ~~HERPTILES~~ (SPECIES)	JUNE 1975 DENSITY Number Individuals	JUNE 1975 DENSITY Number per ha	JUNE 1976 DENSITY Number Individuals	JUNE 1976 DENSITY Number per ha	JUNE DENSITY CHANGE, % Number Individuals	JUNE DENSITY CHANGE, % Number per ha	AUGUST 1975 DENSITY Number Individuals	AUGUST 1975 DENSITY Number per ha	AUGUST 1976 DENSITY Number Individuals	AUGUST 1976 DENSITY Number per ha	AUGUST DENSITY CHANGE, % Number Individuals	AUGUST DENSITY CHANGE, % Number per ha
Greasewood	Eastern Fence Lizard	1	-	1	-			1	-	-	-		
	Sagebrush Lizard	17	1.4	14	1.3			21	1.9	17	1.6		
	Side-blotched Lizard	-	-	4	0.4			3	0.3	4	0.4		
	Western Whiptail	10	0.7	8	0.5			5	0.2	3	0.2		
	Western Rattlesnake	2	-	1	-			-	-	-	-		
	Striped Whipsnake	-	-	-	-			2	-	-	-		
	Total	30	2.1	28	2.2			32	2.4	24	2.2		
	Species Total	4		5				5		3			
Juniper	Eastern Fence Lizard	11	0.9	3	0.2			4	0.2	5	0.5		
	Sagebrush Lizard	28	2.4	40	3.0			39	3.4	43	3.0		
	Side-blotched Lizard	4	0.2	17	1.6			13	1.3	21	2.0		
	Tree Lizard	1	-	1	-			-	-	5	0.5		
	Western Whiptail	8	0.4	16	1.2			7	0.6	4	0.4		
	Western Rattlesnake	-	-	1	-			-	-	-	-		
	Total	52	3.7	78	6.0			63	5.5	78	6.4		
	Species Total	5		6				4		5			
Shadscale	Eastern Fence Lizard	-	-	-	-			1	-	-	-		
	Sagebrush Lizard	21	1.7	26	2.3			34	2.7	25	2.0		
	Side-blotched Lizard	-	-	-	-			5	0.2	-	-		
	Short-horned Lizard	6	1.0	-	-			3	0.2	2	0.2		
	Total	27	2.7	26	2.3			43	3.1	27	2.2		
	Species Total	2		1				4		2			

Table 7

Reptile and amphibian densities in the four major vegetation types for summer 1975 and 1976.

ge 2

Table 7

EGETATION TYPE	*Reptiles and Amphibians* ~~HERPTILES~~ (SPECIES)	JUNE 1975 DENSITY Number Individuals	JUNE 1975 DENSITY Number per ha	JUNE 1976 DENSITY Number Individuals	JUNE 1976 DENSITY Number per ha	JUNE DENSITY CHANGE No. Number Individuals	JUNE DENSITY CHANGE No. Number per ha	AUGUST 1975 DENSITY Number Individuals	AUGUST 1975 DENSITY Number per ha	AUGUST 1976 DENSITY Number Individuals	AUGUST 1976 DENSITY Number per ha	AUGUST [illegible] Individuals	AUGUST [illegible] per ha
iparian Riparian	Leopard Frog	·	-	·	·			1	-	·	-		
	Eastern Fence Lizard	5	0.4	4	0.3			4	0.4	6	0.4		
	Sagebrush Lizard	12	1.1	14	1.1			[illegible]	1.1	15	1.2		
	Side-blotched Lizard	·	·	·	·			[illegible]	·	1	·		
	Tree Lizard	·		2	-			·	-	1	-		
	Western Whiptail	3	0.1	17	0.5			4	0.4	2	0.3		
	Racer	3	-	1				1	-	--	-		
	Striped Whipsnake	·	·	-	-			1	-	1	-		
	Gopher Snake	1	·	-	·			1	-				
	West. Terrestrial Garter Snake	·		·				[illegible]	-	·	·		
	Total	24	1.6	[illegible]	1.9			25	1.6	26	1.9		
	Species Total	5		5				9		6			

Table 8. Bird number, distance from transect lines, and status on sampling lines during June 1976.

PG - primary greasewood
SG - secondary greasewood
OG - off-tract greasewood
PJ - primary juniper
SJ - secondary juniper
OJ - off-tract juniper
PS - primary shadscale
SS - secondary shadscale
OS - off-tract shadscale
PR - primary riparian
OR - off-tract riparian
RG - riparian - greasewood

1/ R - resident
P - passage
? - questionable

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Table 8. (Title on right)

SAMPLING SITE	BIRD (SPECIES)	DISTANCE (m)											NO. OF [illegible] SAMPLES	NO. OF [illegible]	DENSITY		STATUS
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100			Number [illegible]	[illegible]	
PG	American Kestrel							1						1	1		C
	Mourning Dove												4				C
	Common Flicker	1												1	1		U
	Violet-green Swallow	2												1	2		C
	Black Billed Magpie	2						1					2	2	3		C
	Piñon Jay						1	1		5	1	1	5	2	9		C
	Loggerhead Shrike					1			1					2	2		P
	Black-throated Gray Warbler		1											1	1		P
	Rufous-sided Towhee							1						1	1		P
	Black-throated Sparrow	1	3		1								2	2	5		C
	Sage Sparrow	1												1	1		U
	Brewer's Sparrow	3		3		1							3	4	7	0.6	R
	Hirundinidae									1				1	1		
	Paridae												1				
	Fringillidae		2					1					1	2	3		
	Passeriformes						2		1		1			3	4		
	Total	10	6	3	1	2	3	5	2	6	2	1			41	2.0	
SG	American Kestrel	1												1	1		P
	Mourning Dove	2		1									4	2	3		R
	Say's Phoebe								1				2	1	1		S
	Piñon Jay												1				
	Rock Wren	4		2				1	1	1			2	5	9	1.6	R
	House Finch	7		2									3	4	9	2.2	[illegible]
	Lark Sparrow	2			2		1							3	5		[illegible]
	Black-throated Sparrow	7	2	2				2		2				5	15	2.2	R
	Fringillidae	1			1								1	1	2		
	Passeriformes								2					2	2		
	Total	24	2	7	3		1	3	4	3					47	9.6	
OG	Mourning Dove	3		1	1				2				3	4	7	1.2	R
	Violet-green Swallow	1		1										1	2		P
	Piñon Jay												1				

Page 2 Table 2 continued .

SAMPLING SITE	BIRD (SPECIES)	Distance DISTANCE (m)											NO. AUDITORY SAMPLES	NO. [illegible] SAMPLES	DENSITY Number		STATUS
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100			[illegible]	[illegible]	
OG (cont.)	Rock Wren												2				R
	Mockingbird	4	2	4	3			1	1					1	15	1.6	R
	Loggerhead Shrike			2	2		1	4						1	9	0.5	R
	Western Meadowlark	2	3	1	1		2	3					2	3	12	1.0	R
	Rufous-sided Towhee						1						1	1	1		R
	Black-throated Sparrow	1		1			1							1	3		[illegible]
	Brewer's Sparrow			1										1	1		[illegible]
	Passeriformes			1		1								2	2		[illegible]
	Total	11	5	12	7	1	5	8	3						52	4.4	
PJ	Mourning Dove				1	2		1					3	3	4		R
	Common Flicker	2												2	2		R
	Say's Phoebe								1				1	1	1		P
	Gray Flycatcher	1	2	1		1								4	5	0.3	R
	Cliff Swallow								3					1	3		P
	Pinon Jay	40											5	1	40	8.0	P
	Plain Titmouse		1										1	1	1		[illegible]
	Bushtit						1							1	1		[illegible]
	Rock Wren	2							1	2			4	3	5	0.4	R
	Blue-gray Gnatcatcher	1	1	1	2									4	5	0.5	R
	Loggerhead Shrike		1	1	1					1				4	4		[illegible]
	Black-throated Gray Warbler	1												1	1		[illegible]
	Western Meadowlark												1				[illegible]
	Brown-headed Cowbird	4				1								3	5		[illegible]
	House Finch	6		8	4		2	1	2				1	5	23	1.2	R
	Black-throated Sparrow			1										1	1		[illegible]
	Chipping Sparrow	2	2						2					3	6	0.4	R
	Passeriformes										1			1	1		
	Total	59	7	12	8	4	3	2	7	3	1				108	11.8	
SJ	Mourning Dove	5			1		1						1	3	7	2.0	R
	Broad-tailed Hummingbird	1												1	1		[illegible]
	Say's Phoebe										1			1	1		P

Page 3 Table 8 continued

SAMPLING SITE	SPECIES	DISTANCE (m)											NO. AUDITORY SAMPLES	NO. IDENTIFIED SAMPLES	DENSITY Number		STATUS
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100			Observed	per ha	
SJ (cont.)	Gray Flycatcher	1		2	1		1	1						4	6	0.4	R
	Common Raven				1									1	1		P
	Piñon Jay												1				P
	Plain Titmouse			1										1	1		R
	Rock Wren								2				4	1	2		R
	Mountain Bluebird												1				P
	Blue-gray Gnatcatcher	1					1		1					3	3	0.4	R
	Black-throated Gray Warbler		4		2			2						4	8	0.8	R
	House Finch												2				N
	Lark Sparrow	2	1	3	2									3	8	0.8	R
	Black-throated Sparrow	6		2	1			2					1	5	11	2.4	R
	Chipping Sparrow				2			2						2	4	0.2	R
	Fringillidae		1	1									1	2	2		
	Passeriformes						1	1	1		2			2	5		
	Total	16	6	9	10		4	8	4		3				60	6.4	
OJ	Mourning Dove												1				R
	Gray Flycatcher		1			1	2							2	4		R
	Black-billed Magpie	1				3		1	3				5	3	8	0.4	R
	Piñon Jay										3		1	1	3		P
	Plain Titmouse	7	6											2	13		R
	Rock Wren							1	1	1			5	2	3		R
	Mountain Bluebird												1				N
	Blue-gray Gnatcatcher				1									1	1		N
	Black-throated Gray Warbler	5	1										2	3	6	2.0	R
	Lark Sparrow				1									1	1		P
	Black-throated Sparrow							1		2			1	2	3		R
	Chipping Sparrow	2					1						1	2	3		R
	Tyrannidae										1			1	1		
	Passeriformes	1							1	2				3	4		
	Total	16	8		2	4	3	3	5	5	4				50	6.4	

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SAMPLING SITE	BIRD (SPECIES)	DISTANCE (m)											NO. AUDITORY SAMPLES	NO. OBSERVED SAMPLES	DENSITY Number		STATUS
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-60	51-75	76-100	>100			Observed	per ha	
PS	Mourning Dove	2							3	2			5	3	7	0.4	R
	Horned Lark	1												1	1		R
	Rock Wren	1											3	1	1		R
	Sage Thrasher												2				R
	Loggerhead Shrike	1		3		1		4	2	3				10	14	0.3	R
	Western Meadowlark	4	1	1			2	2	2				5	5	12	0.7	R
	House Finch	1												1	1		R
	Lark Sparrow	2	4	1		1								4	8	0.6	R
	Black-throated Sparrow	2	1											2	3		R
	Sage Sparrow	1	1	1										2	3		R
	Brewer's Sparrow	1												1	1		R
	Fringillidae	4	1		1					1		2	1	4	9		
	Passeriformes	2	1							2				3	5		
	Total	22	9	6	1	2	2	6	7	8		2			65	4.4	
SS	American Kestrel												1				U
	Mourning Dove												2				T
	Broad-tailed Hummingbird	1												1	1		N
	Rock Wren												4				R
	Sage Thrasher						5						1	2	5		R
	Western Meadowlark	1	1	2	3				1	1			4	5	9	0.5	R
	Lark Sparrow	10		4	1	1	2		1					4	19	4.0	R
	Black-throated Sparrow	3				1								2	4		R
	Sage Sparrow	1		1										2	2		R
	Brewer's Sparrow	1	1	1										3	3	0.4	R
	Fringillidae	1			1					3				2	5		
	Passeriformes	1											1	1	1		
	Total	19	2	8	5	2	7		2	4					49	7.6	
OS	Mourning Dove									2				1	2		P
	Western Kingbird	1												1	1		P
	(Sage Thrasher								1		1		1	2	2		?
	Rock Wren												2				

Table [illegible] (continued)

SAMPLING SITE	BIRD (SPECIES)	DISTANCE (m)											NO. AUDITORY SAMPLES	NO. OBSERVATIONAL SAMPLES	DENSITY (Number)		STATUS
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100			Observed	Per ha	
DS (cont.)	Western Meadowlark								2	1	2		2	3	5		R
	Black-throated Sparrow		1					1					3	2	2		R
	Sage Sparrow	3	2						4				1	4	9	1.2	R
	Brewer's Sparrow					1	2						1	2	3		R
	Falconidae	1												1	1		R
	Fringillidae	1			5		2	1		1	1			11	11		
	Total	6	3		5	1	4	1	7	4	4				36	2.4	
PR	Spotted Sandpiper	3						3						3	6		R
	Mourning Dove	4											5	2	4		R
	White-throated Swift	3												1	3		R
	Common Flicker												4				R
	Ash-throated Flycatcher				1	1								2	2		R
	Say's Phoebe							1					3	1	1		R
	Gray Flycatcher			1										1	1		R
	Cliff Swallow			3										1			R
	Black-billed Magpie	6							3	5			5	4	14	2.4	R
	Piñon Jay												2				R
	Black-capped Chickadee					2							1	1	2		R
	[illegible]						1	1						1	2		R
	Mountain Bluebird	1				1								1	2		R
	Cedar Waxwing			5		1								3	6		R
	Starling	3												1	3		R
	Yellow Warbler	1	1	1	3		3							5	9	0.6	R
	Yellow-breasted Chat							1					4	1	1		R
	Red-winged Blackbird		1											1	1		R
	Brown-headed Cowbird	13		2					2					5	17	5.2	R
	Brewer's Blackbird	1												1	1		R
	Black-headed Grosbeak			2										1	2		R
	Blue Grosbeak				2									1	2		R
	Lazuli Bunting				1			2						2	3		R
	House Finch	3			2			8					1	3	13	1.2	R
	American Goldfinch	1												1	1		R
	Rufous-sided Towhee	4			1	1		1					4	4	7	1.6	R

SAMPLING SITE	BIRD (SPECIES)	DISTANCE (M) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	NO. [illegible]/ SINGERS	NO. OF TIMES [illegible]	[illegible] Number	Per ha	STATUS
PP (cont.)	Lark Sparrow	4	2			1			1					3	8	1.6	R
	Passeriformes	1												1	1		
	Total	48	4	14	10	7	4	17	6	5					115	19.2	
OR	Green-winged Teal								3					1	3		[illegible]
	Red-tailed Hawk								1					1	1		[illegible]
	American Kestrel	1									2		1	2	3		[illegible]
	Belted Kingfisher								2		1			3	3		[illegible]
	Mourning Dove	2								2			5	4	10	[illegible]	[illegible]
	Common Flicker	1				1		1					3	2	3		R
	[illegible]	1												1	[illegible]		[illegible]
	Ash-throated Flycatcher					2								1	2		[illegible]
	Say's Phoebe						1							1	1		[illegible]
	Empidonax (Willow?)	2			2		1		1					1	7	[illegible]	R
	Cliff Swallow	5		20				3						3	28	[illegible]	[illegible]
	Black-billed Magpie												2				[illegible]
	Pinyon Jay										4			1	4		[illegible]
	Black-capped Chickadee	1	1										2	2	2		[illegible]
	Rock Wren	1					1	1		2			4	4	[illegible]		[illegible]
	American Robin	1		3				1	1				2	4	[illegible]	0.[illegible]	[illegible]
	Blue-gray Gnatcatcher		1	1										2	2		[illegible]
	Cedar Waxwing	9		5	3									4	17	3.6	[illegible]
	Starling	3							1	1				4	5	[illegible]	R
	Warbling Vireo	1	1		2									3	4	0.4	[illegible]
	Yellow Warbler	7	5	8	2	2	2							5	26	[illegible]	[illegible]
	Yellow-rumped Warbler	2					1							3	3	0.[illegible]	[illegible]
	Black-throated Gray Warbler		1		1									2	2		[illegible]
	MacGillivray's Warbler				1									1	1		[illegible]
	Common Yellowthroat	2												1	2		[illegible]
	[illegible]	4								2			4	4	6	1.[illegible]	[illegible]
	[illegible]	[illegible]	1	1			2	2	2					4	16	3.2	[illegible]
	[illegible]	[illegible]	[illegible]	6				4	1					5	29	6.0	[illegible]
	[illegible] Towhee	[illegible]		2				2						3	6	0.8	[illegible]
	[illegible]	[illegible]		1										2	3		[illegible]

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Table 8 (continued)

Sampling SITE	SPECIES	DISTANCE (m)											NO. AUDITORY SAMPLES	NO. OBSERVED SAMPLES	DENSITY Number		STATUS
		0-5	5-10	10-15	15-20	21-25	25-30	31-40	41-50	51-75	75-100	>100			Observed	per ha	
OR (cont.)	House Finch	27	5	5	7	3		4	4				1	5	53	10.8	R
	American Goldfinch	9							1					4	10	3.6	R
	Rufous-sided Towhee	4	4	2			1	1					5	2	13	1.6	R
	Lark Sparrow	4				3								3	7	1.6	R
	Piciformes												1				
	Paridae	2	2											4	4		
	Fringillidae	9	1											5	10		
	Passeriformes	2												4	5		
	Total	33	26	52	18	13	9	17	18	12	8				302	53.2	
R.G	Prairie Falcon								1					1	1		P
	American Kestrel				1									1	1		P
	Mourning Dove				1				1				2	1	2		?
	Broad-Tailed Hummingbird	2												2	2		R
	Willow Flycatcher	1												1	1		?
	Black-billed Magpie	1						3	2				3	3	6	0.4	R
	Rock Wren	1					3						4	2	4		R
	Blue-gray Gnatcatcher	3	1			1							4	5	11	3.6	R
	Yellow-breasted Chat	2		1	1								4	3	4	0.8	R
	Rufous-sided Towhee	7	4	3		1							5	5	15	2.8	R
	Falconiformes									1				1	1		
	Troglodytidae	1												1	1		
	Passeriformes					2	1							1	3		
		24	5	4	3	4	4	3	4	1					53	9.6	

Table 9. Bird number, distance from transect line, and status on sampling sites during August 1976.

sampling sites on Table 8

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Table 9 (Title on right)

CAMPAIGN SITE	BIRD (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Auditory Samples	No. Observ. Samples	[illegible] Obs.	[illegible]	STATUS
PG	Mourning Dove	1											1	1	1		P
	Say's Phoebe												2				P
	Pinyon Jay	12								15		3	3	3	30	2.4	P
	Rock Wren												4				R
	Sage Thrasher	1												1	1		R
	Loggerhead Shrike			1			1							2	2		R
	Scott's Oriole			1										1	1		R
	Sage Sparrow	2												1	2		R
	Chipping Sparrow	4		5										3	9	0.8	R
	Brewer's Sparrow	1	7	2										3	10	0.8	R
	Empidonax (unidentified)		1											1	1		
	Passerine	2												2	2		
	Total	23	8	9			1			15		3		5	59	4.6	
SG	Golden Eagle				2									1	2		P
	Pinyon Jay				6								2	1	6		P
	Rock Wren					1		1					3	1	2		R
	Loggerhead Shrike	2												2	2	0.8	R
	Black-throated Sparrow	4											1	2	4	1.6	R
	Sparrow (unidentified)					4		1					1	2	5		
	Total	6			8	5		2						4	21	[illegible]	
OG	Golden Eagle											2		1	2		P
	Mourning Dove								2					1	2		P
	Ash-throated Flycatcher			3										1	3		P
	Say's Phoebe	2		2										3	4	0.8	R
	Pinyon Jay	41											2	2	41	16.4	P
	House Wren			1										1	1		R
	Rock Wren								1				4	1	1		R
	Sage Thrasher	1												1	1		R
	Mountain Bluebird		1				1							2	2		P
	Western Meadowlark	4	1	1		2	2		1					5	11	1.6	R
	Rufous-sided Towhee	1												1	1		R

Table [illegible]

Page 2 Table 9 continued

SAMPLING SITE	BIRD (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Audible Contacts	No. Observ. Groups	DENSITY Number Observed	DENSITY per/ha	STATUS
OG (Cont.)	Lark Sparrow													1	1		[illegible]
	Black-throated Sparrow	5		2		2								4	9	2.0	[illegible]
	Chipping Sparrow	2												1	2	0.3	[illegible]
	Passeriformes	1							1	1				3	3		
	Total	57	2	9	1	4	3		5	1		2		5	84	22.8	
PT	Gray Flycatcher	1												1	1		F
	Piñon Jay			8		19	1	3	2				1	2	23	0.9	P
	Rock Wren												1				R
	Mountain Bluebird	1		1		6							1	2	8	0.3	P
	Trochilidae (Hummingbird)	1												1	1		
	Total	3		9		25	1	3	2					3	43	1.4	
SI	Say's Phoebe					1	1							2	1		[illegible]
	Piñon Jay	25								13			2	[illegible]	37	10.0	[illegible]
	Rock Wren				1				1				4	3	2		[illegible]
	Mountain Bluebird	5					1							4	6	3.0	[illegible]
	Black-throated Sparrow	2											1	1	2	0.8	[illegible]
	Chipping Sparrow	1												1	1		
	Trochilidae (Hummingbird)	1												1	1		
	Empidonax Flycatcher					1		1						2	2		
	Passeriformes	1							1					2	2		
	Total	35			1	2	2	1	2	15				5	56	14.0	
OT	Common Flicker							1						1	1		[illegible]
	Piñon Jay												4				
	Red-breasted Nuthatch		1											1	1		[illegible]
	Rock Wren	1					1	1					2	3	3		R
	Loggerhead Shrike					1								1	1		[illegible]
	House Finch		2											1	2		[illegible]
	Brewer's Sparrow	1												1	1		[illegible]
	Passeriformes	2												2	2		
	Total	4	3			1	1	2						3	11		

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Table 9 . Continued

SAMPLING SITE	BIRD (SPECIES)	D[illegible]ANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Auditory Samples	No. Observed Samples	DENSIT Number Observed	[illegible]	STATUS
PS	American Kestrel							1						1	1		P
	Mourning Dove							1					1	1	1		R
	Common Nighthawk				1									1	1		C
	Horned Lark		1											1	1		R
	Piñon Jay		1					1			20	2	2	2	24		R
	Rock Wren	1		1	1								2	2	3		C
	Loggerhead Shrike	3			1	1		2					1	5	7	0.6	C
	Western Meadowlark	3	2					1		1			3	4	7	0.6	C
	Black-throated Sparrow			2										1	2		R
	Sage Sparrow	9	2	6	2					7			4	4	26	1.8	R
	Fringillidae (Sparrow)				1			2						2	3		
	Total	16	6	9	6	1		8		8	20	2		5	76	3.2	
SS	American Kestrel											1		1	1		P
	Piñon Jay	6		10	17								2	1	33	3.6	P
	Sage Thrasher	1												1	1		R
	Western Meadowlark	3	4	2					2				4	2	11	1.2	R
	Rufous-sided Towhee							1	2					2	3		C
	Sage Sparrow	1												1	1		R
	Trochilidae (Hummingbird)	1												1	1		C
	Total	12	4	12	17			1	4					5	50	4.8	
OS	Piñon Jay					20							2	1	20	1.6	P
	Rock Wren												1				R
	Sage Thrasher		1										2	1	1		R
	Loggerhead Shrike									1				1	1		?
	Western Meadowlark												1				?
	Sage Sparrow	1												1	1		?
	Fringillidae (Sparrow)	2												2	2		
	Total	3	1			20				1				4	25	1.9	

Page #

Table 9 Continued

SAMPLING SITE	BIRD (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Auditory Samples	No. Observed Samples	DENSITY Number Observed	per/ha	STATUS
PR	Golden Eagle	1												1	1	0.4	R
	Spotted Sandpiper	1	1											2	2	0.4	R
	Mourning Dove			2										1	2		[illegible]
	Common Nighthawk	1			1									2	2	0.4	[illegible]
	Common Flicker												2				R
	Hairy Woodpecker		1											1	1		R
	Say's Phoebe	1		1			2			1				2	5	0.4	R
	Rough-winged Swallow										2			1	2		O
	Cliff Swallow	6		2				2			4			4	14	0.4	P
	Black-billed Magpie	1						1					3	2	2	0.4	R
	Black-capped Chickadee												2				R
	White-breasted Nuthatch	1												1	1	0.4	R
	Rock Wren												3				R
	American Robin	1		1		3	1							2	6	0.4	R
	Blue-gray Gnatcatcher												1				N
	Warbling Vireo		1											1	1		N
	Yellow Warbler	2	1	1			1	1					5	3	6	0.8	R
	Northern Oriole												1				P
	Western Tanager		1											1	1		P
	Rufous-sided Towhee	1		1									2	1	2	0.4	R
	Chipping Sparrow				2									1	2		P
	Brewer's Sparrow	1												1	1	0.4	N
	Parulidae (Warbler)	1												1	1		
	Fringillidae (Sparrow)	1	2											2	3		
	Passeriformes	1					1							1	2		
	Total	20	7	8	3	3	5	4		1	6			5	57	7.0	
OR	Great Blue Heron						1				1			2	2		R
	Cooper's Hawk						1							[illegible]	1		R
	Red-tailed Hawk	1		1							1			3	3	0.4	R
	Spotted Sandpiper	1						1		1			1	3	3	0.4	[illegible]
	Mourning Dove	1						2					1	2	3	0.4	[illegible]
	Common Flicker							2	1	5			2	3	8		R
	Downy Woodpecker			1			1							2	2		R

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Table 9. Continued

SAMPLING SITE	BIRD (SPECIES)	0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-60	51-75	76-100	>100	No. Ind'ls Singing	No. Observ. Samples	DENSITY/Number Observed	DENSITY/Number per/ha	STATUS
		DISTANCE (m)															
OR (Cont.)	Say's Phoebe						1							1	1		P
	Rough-winged Swallow						11							1	11	0.7	R
	Black-billed Magpie										1	1		1	2		P
	Scrub Jay	1												1	1	0.4	P
	Black-capped Chickadee	2												1	2	0.8	R
	Rock Wren							1					2	1	1		R
	American Robin												2				[illegible]
	Mountain Bluebird				1									1	1		[illegible]
	Yellow Warbler	3	2	2			2						4	4	9	1.2	R
	Yellow-breasted Chat			1			1	1						2	3		R
	Blue Grosbeak				1									1	1		[illegible]
	Green-tailed Towhee	2												1	2	0.8	[illegible]
	Rufous-sided Towhee	2		2	1								5	4	5	0.8	R
	Falconinae (Falcon)										1			1	1		
	Troglodytidae (Wren)			1										1	1		
	Parulidae (Warbler)	1		1			1							3	3		
	Fringillidae (Sparrow)	1			1									1	2		
	Passeriformes	1						1		1	2			4	5		
	Total	16	2	9	4		19	8	1	7	6	1		5	72	6.4	
RG	Golden Eagle									1		2		3	3		P
	Mourning Dove	1												1	1		P
	Common Nighthawk	1												1	1		P
	Common Flicker	9				6			3					5	18	3.6	R
	Western Kingbird			1										1	1		[illegible]
	Say's Phoebe	1						2						2	3	0.4	R
	Black-billed Magpie	2												1	2	0.8	[illegible]
	Pinyon Jay	4					2			2				3	8	1.6	[illegible]
	Black-capped Chickadee		1											1	1		P
	Rock Wren	3		1					3				4	4	7	1.2	R
	Mountain Bluebird		1	2				1						2	4		[illegible]
	Blue-gray Gnatcatcher	6	4	1		2		2					3	5	15	2.4	R
	Yellow Warbler	1												1	1		[illegible]
	Yellow-breasted Chat							1						1	1		[illegible]

Page 6	Table 9 Continued	DISTANCE (m)													DENSITY Number		
SAMPLING SITE	BIRD(SPECIES)	0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Auditory Contacts	No. Observed Couples	[illegible]	per ha	STATUS
R.G. (cont.)	Rufous-sided Towhee	2		2		1	1						5	4	6	0.7	R
	Chipping Sparrow	3	1		2									3	6	1.5	R
	Brewers Sparrow	3		3										3	6	1.5	R
	Empidonax Flycatcher	1												1	1		
	Passeriformes	2												2	2		
	Total	39	7	10	2	9	3	6	6	3		2		15	87	15.2	

Table 10. Reptile and amphibian number and distance from transect line on sampling site during June 1976.

sampling sites on Table 8

Fig. 1

Table 10 (Title on right)

SAMPLING SITE	HERPTILE (SPECIES)	DISTANCE (m) 0-1	2	3	4	5	>5	NO. OBSERVED SAMPLES	DENSITY Number observed	per 10
PG	Sagebrush Lizard	7						4	7	
	Western Whiptail	3						2	3	
	Total	10						4	10	
SG	Eastern Fence Lizard					1		1	1	
	Sagebrush Lizard	4		1				4	5	
	Western Whiptail	1		1	1			3	3	
	Western Rattlesnake	1						1	1	
	Lizard, unidentified			1				1	1	
	Total	6		3	1	1		5	11	
OG	Sagebrush Lizard	2						1	2	
	Side-blotched Lizard	4						3	4	
	Western Whiptail	1	1					2	2	
	Total	7	1					4	8	
PJ	Eastern Fence Lizard					1		1	1	
	Sagebrush Lizard	10	5	2	1			5	18	
	Side-blotched Lizard	4	1					4	5	
	Tree Lizard	1						1	1	
	Western Whiptail		1					1	1	
	Total	15	7	2	1	1		5	26	
SJ	Sagebrush Lizard	9	1					5	10	
	Side-blotched Lizard	4						2	4	
	Western Whiptail	9	1					4	10	
	Western Rattlesnake	1						1	1	
	Lizard, unidentified	1						1	1	
	Total	24	2					5	26	

Table 10. Herptile
from
site

PG - primary gras
SG - secondary gr
OG - off-tract gra
PJ - primary juni
SJ - secondary jun
OJ - off-tract jun
PS - primary shrub
SS - secondary shr
OS - off-tract shrub
PR - primary ripari
OR - off-tract ripa
RG - riparian-gr

Page 2 Table 10 continued

SAMPLING SITE	HERPTILE (SPECIES)	DISTANCE (m) 0-1	2	3	4	5	>5	NO. OBSERVED SAMPLES	DENSITY Number observed	per [illegible]
OI	Eastern Fence Lizard	2						2	2	
	Sagebrush Lizard	11	1					4	12	
	Side-blotched Lizard	8						2	8	
	Western Whiptail	3	2					2	5	
	Total	24	3					4	27	
PS	Sagebrush Lizard	5		1				3	6	
	Lizard			2				2	2	
	Total	5		3				3		
SS	Sagebrush Lizard	3	1					3	4	
OS	Sagebrush Lizard	15	1					4	16	
PR	Eastern Fence Lizard					1		1	1	
	Western Whiptail	1	2	1				4	4	
	Racer		1					1	1	
	Total	1	3	1		1		5	6	
OR	Eastern Fence Lizard	1						1	1	
	Sagebrush Lizard	1		1				2	2	
	Western Whiptail	3	3	4	1	2		5	13	
	Tree Lizard	1						1	2	
	Total	6	3	5	1	3		5	18	
RG	Eastern Fence Lizard	1	1					1	2	
	Sagebrush Lizard	7	5					3	12	
	Total	8	6					3	14	

Table 11. Reptile and amphibian number, distance from transect line, and status on sampling sites during August 1976.

sampling sites on Table 8

Page 1

Table II. Title on right

SAMPLING SITE	Reptile and Amphibian ~~HERPTILE~~ (SPECIES)	DISTANCE (m) 0-1	2	3	4	5	>5	No. Observed Samples	DENSITY Number observed	DENSITY Number predicted	STATUS
PG	Sagebrush Lizard	8	1					10	[illegible]		P.
	Western Whiptail	1		1				2	2		P.
	Lizard (Unidentified)	1	1					[illegible]	1		
	Total	10	2	1				5	13		
SG	Sagebrush Lizard	4						5	4		P.
	Side-blotched Lizard	1						1	1		P
	Western Whiptail	1						1	1		P.
	Total	6						4	6		
OG	Sagebrush Lizard	4						3	4		P.
	Side-blotched Lizard	3						1	3		P.
	Lizard (Unidentified)					1		1	1		
	Total	7				1		4	8		
PT	Eastern Fence Lizard	4						3	4		P
	Sagebrush Lizard	9	2					5	11		P
	Side-blotched Lizard	8	1					4	9		P
	Tree Lizard	4	1					2	5		P
	Western Whiptail	1						1	1		P
	Total	26	4					5	30		
ST	Sagebrush Lizard	11	4					5	15		P
	Side-blotched Lizard	5						4	5		P
	Western Whiptail	2						1	2		P
	Lizard (Unidentified)	1							1		
	Total	19	4					5	[illegible]		

Table II. He
from transe
sampling s
1976.
PG - prim
SG -
OG -
PT - prim
ST -
OT -
TC -
SC -
OC -
FR -
OR -
FG -

P - permanent (summer months)
T - transient

Page 2 | [illegible]ble II continued

SAMPLING SITE	HE~~RPTILE~~ (SPECIES)	DISTANCE (m) 0-1	2	3	4	5	>5	No. Observ. + samples	DENSITY Number Observed	Per/ha	STATUS
OT	Eastern Fence Lizard	1						1	1		P
	Sagebrush Lizard	10	5	2				5	17		P
	Side-blotched Lizard	7						3	7		P
	Western Whiptail	1						1	1		P
	Lizard (Unidentified)			1				1	1		
	Total	19	5	3				5	27		
PS	Sagebrush Lizard	7						4	7		P
	Short-horned Lizard	1						1	1		P
	Total	8						4	8		
SS	Sagebrush Lizard	5	1					4	6		P
	Short-horned Lizard	1						1	1		P
	Total	6	1					4	7		
OS	Sagebrush	8	3	1				5	12		P
PR	NONE										
OR	Eastern Fence Lizard	2						2	2		P
	Tree Lizard	1						1	1		P
	Western Whiptail	2						2	2		P
	Striped Whipsnake	1						1	1		T
	Lizard (Unidentified)	1						1	1		
	Total	7						5	7		
RG	Eastern Fence Lizard	1		3				3	4		P
	Sagebrush Lizard	9	3	3				4	15		P
	Side-blotched Lizard			1				1	1		P
	Total	10	3	7				5	20		

Table 12. Mammal number and
distance from transect line
on sampling site during
June 1976 (evening transect)

sampling sites on Table 8

Page 1 SAMPLING SITE	Table 12 (Title on right) MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	NO. OBSERVED SAMPLES	DENSITY/ Number Observed	per ha
PG	Whitetail Antelope Squirrel	1	1	2									2	4	
	Desert Cottontail	4							1	2	1		4	8	0.8
	Total	5	1	2					1	2	1		4	12	1.0
SG	Golden-mantled Squirrel						1						1	1	
	Whitetail Antelope Squirrel	1							1				2	2	
	Least Chipmunk						1						1	1	
	Desert Cottontail	4		2					2				4	8	1.6
	Total	5		2			2		3				4	12	2.0
OG	Whitetail Antelope Squirrel	2		2	1								1	5	
	Chipmunk														
	Desert Cottontail	13	4	7	7	2	3	4	4	6			5	50	5.0
	Total	15	4	9	8	2	3	4	4	6			5	55	6.0
PJ	Desert Cottontail	3	1	1		1							4	6	0.6
SJ	Desert Cottontail	3			1			3					5	7	1.2
OJ	Desert Cottontail	5			1	1							5	7	2.0
PS	Desert Cottontail	12	2	3	2		2		2				5	23	2.1
SS	Desert Cottontail	5							1				4	6	2.0
OS	Desert Cottontail	4											3	4	1.6

Page 2

Table 12 continued

SAMPLING SITE	MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	NO. OBSERVED TIMES	DENSITY Number Observ.	DENSITY Number Per ha
PR	Beaver			1					2				2	3	
	Desert Cottontail	2											2	2	0.8
	Total	2		1					2				4	5	0.2
OR	Whitetail Antelope Squirrel							1					1	1	
	Desert Cottontail	3	1										3	4	1.2
	Total	3	1					1					4	5	1.2
RG	Desert Cottontail	13	1	5		3	2	1					5	25	5.2

Table 13. Mammal number and
distance from transect line
on sampling site during June 1976
(morning transect)

sampling sites on Table 8

Page 1 SAMPLING SITE	Table 13. (Title on right) MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	NO. OBSERVED SAMPLES	DENSITY Number observed	per ha
PG	Golden-mantled Squirrel								1				1	1	
	Whitetail Antelope Squirrel							1					1	1	
	Desert Woodrat	1											1	1	
	Desert Cottontail	3		1	1	1		2	5	6		1	5		0.6
	Total	4		1	1	1		3	6	6		1	5	23	0.8
SG	Golden-mantled Squirrel				1								1	1	
	Whitetail Antelope Squirrel	1				1							2	2	
	Chipmunk								2	2	1		2	5	
	Desert Cottontail	5	2	1		2				2			5	12	2.0
	Total	6	2	1	1	3			2	4	1		5	20	2.4
OG	Whitetail Antelope Squirrel	10	2			2	1	1					5	16	4.0
	Chipmunk					1							1	1	
	Desert Cottontail	11	3	5	5	1		5	3	5			5	38	4.4
	Total	21	5	5	5	4	1	6	3	5			5	55	2.4
PI	Whitetail Antelope Squirrel						3						2	3	
	Chipmunk	1						1					2	2	
	Desert Cottontail	7				1		1					5	9	1.4
	Mule Deer									1			1	1	
	Total	8				1	3	2		1			5	15	1.6
SI	Golden-mantled Squirrel			1									1	1	
	Chipmunk			1			1						2	2	
	Desert Cottontail	2						2	2	1			3	7	0.8
	Mule Deer							1					1	1	
	Total	2		2			1	3	2	1			4	11	0.8

Page 2 Table 13 continued

SAMPLING SITE	MAMMAL (SPECIES)	DISTANCE (m)											NO. OBSERVED AREAS	DENSITY	
		0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100		Number Observed	per ha
OT	Whitetail Antelope Squirrel	2	1	2	1				1				4	7	0.2
	Squirrel		1										1	1	
	Chipmunk	3		1		1							4	5	1.2
	Desert Cottontail	4		1			1						4	6	1.6
	Total	9	2	4	1	1	1		1				4	19	3.6
PS	Desert Cottontail	12	4	1	3	2	2	1	1	1	1		5	28	2.4
SS	Desert Cottontail	1		2			1				1		3	5	0.4
OS	Whitetail Antelope Squirrel							1					1	1	
	Desert Cottontail	1		1	2	3							3	7	
	Total	1		1	2	3		1					4	8	0.6
PR	Desert Cottontail	2				2							3	4	
OR	Desert Cottontail	12	1		1	2							5	16	4.8
	Mule Deer	1		1									2	2	
	Total	13	1	1	1	2							5	18	5.2
RG	Squirrel									1			1	1	
	Chipmunk							1					1	1	
	Desert Cottontail	10		5	2	1	1		3				5	22	4.0
	Total	10		5	2	1	1	1	3	1			5	24	4.0

Table 14. Mammal number, distance from transect, and density from evening transect lines on sampling site during August 1976.

sampling sites on Table 8

Page

Table 14

ble 14. Title on right

SAMPLING SITE	MAMMAL (SPECIES)	Distance (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. Observed Samples	DENSITY Number Observed	DENSITY Number per/ha	STATUS
PG	Desert Cottontail	14	1	2		2		1			1		5	21	2.7	R
	Mule Deer										2	2	2	4		
	Total	14	1	2		2		1			3	2	5	25	2.8	
SG	Bat	1											1	1	0.4	
	Whitetail Antelope Squirrel				1								1	1		P
	Desert Cottontail	8	3	1	1		1			1			4	15	3.2	R
	Total	9	3	1	2		1			1			5	17	3.6	
OG	Bat	5											3	5	2.0	
	Whitetail Antelope Squirrel					1							1	1		R
	Desert Cottontail	23	8	6	3	5	5	1	5	4			5	60	9.2	R
	Total	28	8	6	3	6	5	1	5	4			5	66	11.2	
PJ	Desert Cottontail	11	15		3	2	1	4	3	2			4	37	2.4	R
SJ	Desert Cottontail	5	1			1	1	2	1				5	11	2.0	R
OJ	Least Chipmunk							1					1	1		R
	Desert Cottontail	7	4	1		2	2		3				5	19	2.8	R
	Total	7	4	1		2	2	1	3				5	20	2.8	
PS	Whitetail Antelope Squirrel		1	7									3	8	0.5	R
	Desert Cottontail	9	4	2	4	2		2	2	1			5	26	1.8	R
	Total	7	5	9	4	2		2	2	1			5	34	2.3	
SS	Bat	1											1	1	0.4	
	Desert Woodrat	3											3	3	1.2	R
	Desert Cottontail	2	2										3	4	0.8	R
	Total	6	2										3	8	2.4	

Page 2 Table 14 Continued

SAMPLING SITE	MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	No. observed Samples	DENSITY Number Observed	DENSITY Number No./ha	STATUS
OS	Desert Cottontail	13	1	1		2							5	17	5.2	R
PR	Bat	2			1		1						3	4	0.8	
	Beaver					1	1			2			3	4		R
	Desert Cottontail	15		1									5	16	6.0	R
	Mule Deer	2									1		2	3	0.2	R
	Cattle (Hereford)	1		1		1	1	10	1	6	2		4	23	0.4	R
	Total	20		2	1	2	3	10	1	8	3		5	50	8.0	
OR	Bat	16	4	2	5		3	2	1	1			5	34	6.4	
	Beaver	1											1	1	0.4	R
	Porcupine		1										1	1	0.2	R
	Desert Cottontail	13	3		1			1	1				5	19	5.2	R
	Mule Deer	1								1			2	2	0.4	R
	Cattle (Hereford)	2		1	2			3					2	8	0.8	R
	Total	33	8	3	8		3	6	2	2			5	65	13.4	
RG	Desert Woodrat					1							1	1		
	Desert Cottontail	18	4	7	1	2	5	3	4	2			5	46	7.0	
	Total	18	4	7	1	3	5	3	4	2			5	47	7.2	

Table 15. Mammal number, distance from transect line, and density from morning transect lines on sampling site during August 1976.

sampling sites on Table 8

Page 1 SAMPLING SITE	Table 5. Title on right MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	[illegible]	DENSITY [illegible]	 [illegible]	STATUS
PG	Desert Cottontail	10	1	3	2				1	1			5	18	2.0	R
SG	Whitetail Antelope Squirrel				4								2	4	0.4	R
	Desert Cottontail	7	1	1	4	4		[illegible]	2	1			5	36	2.8	R
	Total	7	1	1	8	4		6	2	1			5	40	3.2	
OG	Whitetail Antelope Squirrel	1	1	1	1	1							3	5	0.4	R
	Desert Cottontail	18	9	6		2	3		1	2	1		5	45	7.2	R
	Total	19	10	7	1	3	3		1	2	1		5	47	7.6	
PI	Golden-mantled Squirrel				1								1	1		R
	Whitetail Antelope Squirrel				1								1	1		R
	Least Chipmunk	2			1								1	3	0.4	R
	Desert Cottontail	17	6	4	2	1		4	5				5	38	3.4	R
	Total	19	6	4	5	1		4	5				5	44	3.8	
SI	Golden-mantled Squirrel	1											1	1	0.4	R
	Desert Cottontail	4	2	3	1	1			1				5	12	1.6	R
	Total	5	2	3	1	1			1					13	2.0	
OI	Desert Cottontail	11	1	1									5	14	4.4	R
PS	Desert Cottontail	11	1	3	1	1	1	2		3			5	23	2.2	R
SS	Desert Cottontail	6									1		5	9	2.4	R
OS	Desert Cottontail	4		1	1				1	1			5	13	2.6	R

Table 15. Mammal [illegible] distance from transect line and density from morning transect lines on sampling [illegible]

PG - primary [illegible]
SG - [illegible]
OG - off-road [illegible]
PI - primary [illegible]
SI - [illegible]
OI - [illegible]
PS - [illegible]
SS - [illegible]
OS - [illegible]
PP - primary [illegible]
OR - [illegible]
RG - [illegible]

Page 2 | Table 15 Continued

SAMPLING SITE	MAMMAL (SPECIES)	DISTANCE (m) 0-5	6-10	11-15	16-20	21-25	26-30	31-40	41-50	51-75	76-100	>100	[illegible]	Density/Number: [illegible]	Per/ha	[illegible]
CF	[illegible] Cottontail	[illegible]	[illegible]	[illegible]	1								[illegible]	9	1.6	R
	Mule Deer												[illegible]	2		R
	Cattle (Hereford)	2	1	3	1		2	[illegible]		1	[illegible]		[illegible]	27	0.9	R
	Total	6	3	5	2		3	16		1	[illegible]		[illegible]	38	3.4	
OR	Desert Cottontail	14	5	1	1		3						[illegible]	33	5.6	R
	Mule Deer	2											[illegible]	[illegible]	0.3	R
	Cattle (Hereford)		2	2			4		[illegible]	[illegible]			[illegible]	12	2.4	R
	Total	16	7	3	1		6		[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	
RG	[illegible]	1		1									[illegible]	[illegible]	0.4	R
	[illegible] Cottontail	[illegible]	3	5	2	4	4	3	[illegible]	4			[illegible]	[illegible]	[illegible]	R
	Total	19	[illegible]	6	[illegible]	4	4	[illegible]	[illegible]	4			[illegible]	47	[illegible]	

Table 16. Number of rodents captured within rodent trapping transects on sampling sites during June 1976 (24 Sherman live traps for 5 nights = 120 trap nights/sampling site.

sampling sites on Table 8

Page 1

Table 16 (Title on right)

SAMPLING SITE	RODENT (SPECIES)	NUMBER CAPTURED Night 1	2	3	4	5	NUMBER CAPTURED FIRST TIME Night 1	2	3	4	5	No. of Captures	No. of Captures/100 Trap Nights	No. of Animals	No. of Animals/100 Trap Nights	No. Dead in Trap	Sex Ratio M/F	Age Ratio Ad./Juv.
PG	Apache Pocket Mouse	1	-	1	-	-	1	-	-	-	-	2	2	1	1	-	1/0	1/0
	Ord Kangaroo Rat	6	5	6	6	6	6	1	2	-	-	29	24	9	7	-	1/.5	9/0
	Western Harvest Mouse	-	-	-	1	-	-	-	-	1	-	1	1	1	1	-	1/0	1/0
	Deer Mouse	4	6	5	7	9	4	4	1	2	1	31	26	12	10	-	1/.3	11/1
	Desert Woodrat	1	2	1	1	-	1	1	-	-	-	5	4	2	2	1	[illegible]	1/1
	Total	12	13	13	15	15	12	6	3	3	1	68	57	25	20	1		
SG	Whitetail Antelope Squirrel	1	2	1	2	-	1	1	-	1	-	6	5	3	2	-	1/2	3/0
	Apache Pocket Mouse	3	5	5	5	-	3	3	3	-	-	18	15	9	7	-	1/.5	8/1
	Western Harvest Mouse	-	1	2	-	-	-	1	1	-	-	3	2	2	2	-	1/1	2/0
	Deer Mouse	2	3	7	10	6	2	2	4	4	2	28	23	14	12	-	[illegible]	1/.3
	Total	6	11	15	17	6	6	7	8	5	2	55	46	28	23	-		
OG	Apache Pocket Mouse	1	2	2	3	5	1	1	1	1	2	13	11	6	5	-	[illegible]	[illegible]
	Ord Kangaroo Rat	1	2	1	1	1	1	1	-	-	-	6	5	2	2	-	[illegible]	[illegible]
	Deer Mouse	3	6	4	7	4	3	4	1	5	1	24	20	14	12	-	[illegible]	[illegible]
	Desert Woodrat	-	1	-	1	1	-	1	-	-	-	3	2	1	1	-	1/0	0/1
	Total	5	11	7	12	11	5	7	2	6	3	46	38	23	19	1		
PJ	Whitetail Antelope Squirrel	1	-	-	-	-	1	-	-	-	-	1	1	1	1	-	1/0	1/0
	Least Chipmunk	1	1	2	1	-	1	-	1	-	-	5	4	2	2	-	[illegible]	2/0
	Apache Pocket Mouse	1	-	1	2	1	1	-	1	1	-	5	4	3	2	-	1/2	3/0
	Cañon Mouse	2	1	2	3	1	2	-	-	3	-	9	8	5	4	-	1/1.5	1/.7
	Deer Mouse	2	2	2	1	3	2	-	1	1	3	10	8	7	6	-	1/.4	1/.8
	Piñon Mouse	1	2	1	1	3	1	1	-	-	2	8	7	4	3	1	1/.3	1/3
	Desert Woodrat	2	4	3	4	3	2	2	-	-	-	16	13	4	3	-	1/1	1/1
	Total	10	10	11	12	11	10	3	3	5	5	54	45	26	[illegible]	1		

Table 16. Number of [illegible]
captured within [illegible]
trapping transects on [illegible]
sampling sites during
June, 1976 (24 Sherman
live traps for 5 [illegible]
[illegible] trap nights/sampling
site).
PG- [illegible]
SG- [illegible]
[illegible]

Page 2	Table 16 continued	NUMBER CAPTURED					NUMBER CAPTURED FIRST TIME					No. of Captures	No. of Captures / 100 Trapnights	No. of Animals	No. of Animals / 100 Trapnights	No. Dead in Trap	Sex Ratio M/F	Age Ratio A/Juv.
		Night					Night											
SAMPLING SITE	RODENT (SPECIES)	1	2	3	4	5	1	2	3	4	5							
SI	Whitetail Antelope Squirrel	-	-	2	-	1	-	-	2	-	-	3	3	2	2	-	1/1	2/0
	Least Chipmunk	-	-	-	1	-	-	-	-	1	-	1	1	1	1	-	1/0	1/0
	Apache Pocket Mouse	1	2	-	1	3	1	1	-	1	2	7	6	5	4	-	1/1	1/1
	Cañon Mouse	3	3	4	5	5	3	-	2	2	2	20	17	9	8	1	1/8	1/8
	Deer Mouse	4	4	5	4	4	4	2	2	1	1	21	18	10	8	1	1/7	1/4
	Piñon Mouse	-	1	1	1	1	-	1	-	-	-	4	3	2	2	-	1/1	0/2
	Desert Woodrat	1	2	3	2	1	1	1	2	-	-	9	8	4	3	-	4/0	4/0
	Total	9	12	15	14	15	9	5	9	5	5	65	54	33	28	2		
OI	Whitetail Antelope Squirrel	-	1	-	-	-	-	1	-	-	-	1	1	1	1	-	1/0	1/0
	Least Chipmunk	1	-	2	1	3	1	-	1	-	1	7	6	3	3	-	1/2	3/0
	Apache Pocket Mouse	-	1	1	-	1	-	1	-	-	-	3	2	1	1	-	1/0	1/0
	Cañon Mouse	3	2	3	3	2	2	1	2	-	-	13	11	6	5		1/5	5/1
	Deer Mouse	3	5	3	8	6	3	4	1	2	2	25	21	12	10	-	5/7	11/1
	Piñon Mouse	1	1	1	1	1	1	-	-	-	-	5	4	1	1		1/0	0/1
	Desert Woodrat	1	1	1	2	3	1	-	1	1	2	8	7	5	4	-	1/4	5/0
	Total	9	11	11	15	16	9	7	5	3	5	62	52	29	24	-		
PS	Whitetail Antelope Squirrel	-	-	-	-	1	-	-	-	-	1	1	1	1	1	-	1/0	1/0
	Deer Mouse	5	6	6	5	10	5	3	1	1	3	32	27	13	11	-	1/12	1/12
	Desert Woodrat	-	-	-	1	1	-	-	-	1	-	2	2	1	1	-	0/1	1/0
	Total	5	6	6	6	12	5	3	1	2	4	35	30	15	12	-		
SS	Whitetail Antelope Squirrel	-	1	-	-	-	-	1	-	-	-	1	1	1	1	-	1/0	1/0
	Apache Pocket Mouse	-	-	2	3	-	-	-	2	1	-	5	4	3	2	-	1/2	1/2
	Deer Mouse	5	6	5	7	8	5	2	2	2	3	31	26	14	12	-	1/13	1/13
	Desert Woodrat	1	-	-	-	-	1	-	-	-	-	1	1	1	1	-	0/1	1/0
	Desert Cottontail	-	-	-	-	1	-	-	-	-	1	1	1	1	1	-	1/0	0/1
	Total	6	7	7	10	9	6	3	4	3	4	39	32	20	17	-		

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Table 16 continued

SAMPLING SITE	RODENT (SPECIES)	NUMBER CAPTURED Night 1	2	3	4	5	NUMBER CAPTURED FIRST TIME Night 1	2	3	4	5	No. of Captures	No. of Captures/ 100 Trap Nights	No. of Animals	No. of Animals/ 100 Trap Nights	No. Dead in Traps	Sex ratio M/F	Age ratio Ad/Juv.
OS	Whitetail Antelope Squirrel	1	-	-	-	-	1	-	-	-	-	1	1	1	1	-	0/1	1/0
	Apache Pocket Mouse	1	2	-	2	2	1	1	-	1	-	7	6	3	2	-	1/.5	3/0
	Ord Kangaroo Rat	4	3	4	4	4	4	-	-	1	1	19	16	6	5	2	1/1	6/0
	Deer Mouse	6	5	6	5	7	6	1	1	-	2	29	24	10	9	-	1/.5	1/.4
	Total	12	10	10	11	13	12	2	2	2	3	56	47	20	17	2		
PR	Deer Mouse	6	7	9	8	6	6	5	4	3	-	36	30	18	15	1	1/.7	1/.3
	Desert Cottontail	-	-	1	-	-	-	-	1	-	-	1	1	1	1	-	0/1	0/1
	Total	6	7	10	8	6	6	5	5	3	-	37	31	19	16	1		
OR	Deer Mouse	4	5	6	5	5	4	3	3	1	-	25	21	11	9	1	1/1.5	1/1.5
	Desert Woodrat	1	1	1	-	1	1	-	-	-	1	4	3	2	2	1	1/1	2/0
	Total	5	6	7	5	6	5	3	3	1	1	29	24	13	11	2		
RG	Apache Pocket Mouse	1	1	-	-	1	1	-	-	-	1	3	2	2	2	-	1/[illegible]	2/0
	Ord Kangaroo Rat	1	1	2	1	3	1	1	1	-	1	8	7	4	3	-	1/1	4/0
	Deer Mouse	11	15	18	15	12	11	6	6	4	3	71	59	30	25	7	1/1.5	1/.07
	Bushytail Woodrat	-	-	-	-	1	-	-	-	-	1	1	1	1	1	-	1/0	1/0
	Total	12	17	20	16	17	13	7	7	4	6	83	69	37	31	7		

Table 17. Number of rodents captured
within rodent trapping transects
on sampling sites during August 1976.
(24 Sherman live traps for 5 nights =
120 trap nights / sampling site.)

sampling sites on Table 8.

Page 1

Table 17 (Title on right)

Sampling SITE	RODENT (SPECIES)	NUMBER CAPTURED					NUMBER [illegible]					No. of Captures	No. of [illegible]	No. of Animals	[illegible]	No. [illegible]	Sex Ratio M/F	Age Ratio Ad/Imm
		Night 1	2	3	4	5	Night 1	2	3	4	5							
SG	[illegible] Antelope Squirrel	–	–	–	1	–	–	–	–	1	–	1	1	1	1	–	0/1	1/0
	[illegible] Pocket Mouse	1	2	2	5	1	1	2	[illegible]	2	–	11	9	6	5	–	1/5	[illegible]/0
	Western Harvest Mouse	–	1	–	1	–	–	1	–	–	–	2	2	1	1	–	1/0	1/0
	Deer Mouse	5	5	11	9	10	5	4	4	3	1	40	33	17	14	–	1/6	2/0
	Total	6	8	13	16	11	6	7	5	6	1	54	45	25	21	–		
OG	Whitetail Antelope Squirrel	–	–	–	1	–	–	–	–	1	–	[illegible]	[illegible]	1	1	–	1/0	1/0
	Apache Pocket Mouse	1	–	2	1	2	1	–	1	–	1	6	5	3	2	–	1/2	3/0
	Ord Kangaroo Rat	1	1	1	1	2	1	–	–	–	1	6	5	2	2	–	1/1	[illegible]
	Deer Mouse	8	11	7	6	12	8	6	3	2	4	44	37	22	19	1	1/6	[illegible]
	Desert Woodrat	2	2	2	–	–	2	–	1	–	–	6	5	[illegible]	[illegible]	–	1/2	[illegible]
	Bushytail Woodrat	–	1	–	2	2	–	–	–	–	–	[illegible]	[illegible]	[illegible]	[illegible]	–	1/1	[illegible]
	Total	12	15	12	11	18	12	7	5	4	6	[illegible]	57	34	[illegible]	1		
SJ	Apache Pocket Mouse	–	[illegible]	3	2	–	–	2	–	–	–	6	5	[illegible]	2	–	[illegible]	[illegible]
	Canyon Mouse	2	–	2	1	1	[illegible]	1	–	1	1	6	[illegible]	[illegible]	4	–	[illegible]	[illegible]
	Deer Mouse	6	8	5	[illegible]	8	6	5	1	–	2	[illegible]	[illegible]	[illegible]	15	1	[illegible]	1/0
	Pinon Mouse	3	3	1	2	3	3	–	–	–	1	12	10	4	3	–	1/3	4/0
	Desert Woodrat	3	4	6	6	4	3	1	3	–	1	[illegible]	19	8	7	–	1/3	1/1
	Bushytail Woodrat	–	1	1	–	–	–	1	–	–	–	[illegible]	2	1	1	–	1/0	1/0
	Total	14	18	17	13	16	[illegible]	[illegible]	5	1	5	[illegible]	65	34	[illegible]	1		
OJ	Least Chipmunk	–	1	1	1	–	–	1	–	–	–	[illegible]	[illegible]	1	1		1/0	1/0
	Apache Pocket Mouse	–	–	1	–	–	–	–	1	–	–	1	1	1	1	–	0/1	1/0
	Canyon Mouse	–	1	1	–	–	–	1	–	1	–	[illegible]	[illegible]	2	[illegible]	–	1/1	2/0
	Deer Mouse	9	9	6	7	[illegible]	9	3	–	2	[illegible]	[illegible]	[illegible]	17	14	–	1/4	1/1
	Pinon Mouse	2	3	5	4	6	[illegible]	–	2	1	–	[illegible]	[illegible]	9	[illegible]	–	1/5	[illegible]
	Desert Woodrat	6	5	6	5	7	[illegible]	–	–	–	–	[illegible]	[illegible]	[illegible]	[illegible]	–	1/2	[illegible]
	Bushytail Woodrat	–	–	1	1	–	–	–	–	–	–	–	–	1	1	–	1/0	1/0
	Total	17	19	20	18	17	17	7	6	[illegible]	6	[illegible]	[illegible]	40	33	–		

Table 17. [illegible] captured [illegible] trapping [illegible] on sampling [illegible] during August 1976 (54 Sherman live traps for 5 nights, 150 [illegible])

SG - [illegible]

OG - [illegible]

SJ - [illegible]

OJ - [illegible]

SS - [illegible]

[illegible]

OR - [illegible]

RG - [illegible]

Page 2

Table 17 continued

SAMPLING SITE	RODENT (SPECIES)	NUMBER CAPTURED Night 1	2	3	4	5	NUMBER CAPTURED IN TIME Day 1	2	3	4	5	No. of Captures	No. of Captures/100 trapnights	No. of Animals	No. of Animals/100 trapnights	No. Found Dead	Sex Ratio M/F	Age Ratio Ad/Juv.
SS	Apache Pocket Mouse	1	–	–	1	1	1	–	–	–	–	3	2	1	1	–	0/1	1/0
	Deer Mouse	5	14	10	7	5	5	10	3	4	1	60	35	66	18	–	1/.8	1/.2
	Desert Woodrat	3	2	2	[illegible]	[illegible]	3	–	–	–	–	12	7	[illegible]	[illegible]	–	5/0	3/0
	Total	[illegible]	16	12	[illegible]	8	7	10	3	4	1	75	46	75	61	–		
OS	Apache Pocket Mouse	2	5	–	1	3	2	1	–	1	1	8	7	5	4	–	1/1.5	5/0
	Ord Kangaroo Rat	2	3	3	3	5	2	1	–	–	–	13	11	3	2	–	1/2	3/0
	Western Harvest Mouse	–	–	–	–	1	–	–	–	–	1	1	1	1	1	–	1/0	1/0
	Deer Mouse	5	7	6	6	6	5	3	4	4	3	20	25	19	16	–	[illegible]	19/0
	Desert Woodrat	1	–	1	–	–	1	–	1	–	–	[illegible]	[illegible]	[illegible]	[illegible]	–	1/1	1/1
	Total	10	12	10	10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	–		
OR	Western Harvest Mouse	–	–	2	–	2	–	–	2	–	2	4	3	4	3	–	[illegible]	4/0
	Deer Mouse	16	15	18	22	[illegible]	[illegible]	[illegible]	[illegible]	5	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	–	1/.8	
	Total	16	15	20	22	[illegible]	[illegible]	3	11	5	7	[illegible]	[illegible]	[illegible]	37	–		
RG	Golden-mantled Squirrel	–	–	–	1	–	–	–	–	1	–	1	1	1	1	–	0/1	0/1
	Apache Pocket Mouse	1	1	–	–	–	1	–	–	–	–	2	2	1	1	–	[illegible]	[illegible]
	Ord Kangaroo Rat	2	3	2	3	3	3	1	–	–	–	11	9	3	2	–	[illegible]	[illegible]
	Deer Mouse	10	13	15	9	[illegible]	10	7	8	[illegible]	8	[illegible]	52	[illegible]	29	–	[illegible]	1/.5
	Desert Woodrat	–	–	1	1	1	–	–	1	–	–	3	2	1	1	–	1/0	[illegible]
	Bushy-tail Woodrat	1	–	–	–	–	1	–	–	–	–	1	1	1	1	–	0/1	[illegible]
	Total	14	17	18	13	19	[illegible]	8	9	3	8	70	67	43	35	–		

B. Terrestrial Invertebrates - Identification List of Insects

HYMENOPTERA

Sphecidae (most determinations by R.M. Bohart, Univ. of California at Davis. Others made at Logan, Utah.)

Oxybelus emarginatus Say
Oxybelus parvus Cresson
Oxybelus fossor R. & C.
Oxybelus uniglumis (L.)
Oxybelus packardii Robt.

Belomicrus cladothricis Ckll.
Belomicrus sp #1

Nysson gagates Bradley

Epinysson bellus (Cresson)

Zanysson texanus (Cresson)

Mellinus rufinodus Cresson

Didneis peculiaris W. Fox

Allysson melleus Say

Trypoxylon sp #1
Trypoxylon sp #2
Trypoxylon sp #3

Plenoculus darisii W. Fox
Plencculus sp #1

Solierella sp #1
Solierella sp #2

Bothynostethus sp #1

Pisonopsis sp #1
Pisonopsis sp #2

Liris argentata Pal. d. Beaurois

Tachytes nevadensis R. Bohart
Tachytes distinctus Smith
Tachytes sayi Banks
Tachytes hesperus Banks
Tachytes ermineus Banks

Tachysphex tarsatus Say
Tachysphex propinquus Viereck
Tachysphex cockerellae Rohwer
Tachysphex alpestris Rohwer
Tachysphex aequalis W. Fox
Tachysphex ashmeadii W. Fox

Tachysphex sp #1
Tachysphex sp #2
Tachysphex sp #3

Lyroda subita Say

Dienoplus sp #1

Hoplisoides punctifrons Cameron
Hoplisoides splendidulus Bradley

Gorytes canaliculatus Packard
Gorytes provancheri Handlirsch

Ochleroptera bipunctata (Say)

Mimesa sp #1
Mimesa sp #2

Pemphredon inornatus Say

Stigmus sp #1

Passaloecus sp #1

Diodontus sp #1
Diodontus sp #2
Diodontus sp #3

Lindenius columbianus (Kohl)
Lindenius sp #1

Ectemnius sonorensis (Cameron
Ectemnius besseyae (Rohwer)
Ectemnius continuus (Fabricius)

Crossocerus sp #1
Crossocerus sp #2

Crabro pallidus W. Fox

Ammoplanops cockerelli (Ashmead)

Pulverro sp #1

Spilomena sp #1
Spilomena sp #2

Diploplectron ferrugineum Ashmead

Sphecidae (continued)

Dryudella kohli Cameron
Dryudella rhimps Parker

Astata nevadica Cresson
Astata bechteli Parker
Astata bakeri Parker
Astata occidentalis Cresson

Bembix amoena Handlirsch
Bembix americana spinolae Lep.

Bicyrtes ventralis Say
Bicyrtes capnoptera (Handlirsch)

Steniolia elegans J. Parker
Steniolia duplicata Provancher

Stictiella nubilosa Gilaspy
Stictiella plana W. Fox

Stizoides unicincta (Say)

Cerceris echo Mickel
Cerceris rufinoda Cresson
Cerceris conifrons Mickel
Cerceris californicus Cresson
Cerceris convergens Vier. & Ckll.
Cerceris minax Mickel
Eucerceris canaliculatus (Say)
Eucerceris vittatifrons Cresson

Philanthus gibbosus (Fabricius)
Philanthus miltimaculatus Cameron
Philanthus pacificus Cresson

Ammophila unita Menke
Ammophila aberti Holdeman
Ammophila macra Cresson
Ammophila varipes Cresson
Ammophila breviceps F. Smith
Ammophila cleopatra Menke
Ammophila azteca Cameron
Ammophila pruinosa Cresson
Ammophila procera Dahlbom

Podalonia communis (Cresson)
Podalonia mexicana (Saussure)
Podalonia sericea Murray
Podalonia valida (Cresson)
Podalonia luctuosa (F. Smith)

Palmodes dimidiatus DeGeer

Chlorion aerarium Patton

Fernaldina lucae (Saussure)

Isodontia elegans (Drury)

Sceliphron caementarium Provancher

Prionyx canadensis (L.)

Sphex ichneumonius

C. Vegetation

Revegetation Studies

Field Waste Report
QR#2

THIRD PROGRESS REPORT

January 1, 1976 - June 30, 1976

REVEGETATION STUDIES FOR DISTURBED AREAS AND PROCESSED SHALE DISPOSAL SITES

Submitted by

Utah State University
Agricultural Experiment Station

To

White River Shale Project

Emphasizing Federal Oil Shale Prototype
Leasing Program Requirements, Utah Tracts Ua, Ub

Prepared By: C. M. McKell, Professor of Range Science
Gordon Van Epps, Associate Professor of Range Science
Kent A. Crofts, Research Technician
Steven G. Richardson, Research Technician
Jerry Barker, Research Assistant
Eduardo Alvarez, Graduate Student

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Third Progress Report

Revegetation Studies for Disturbed Areas and Processed Shale Disposal Sites

I. HIGHLIGHTS OF SIX-MONTH REPORT

The tempo of research activity during the past six months has been fast. Greenhouse and laboratory studies were developed in answer to questions raised from field observations in the fall. The availability of Paraho-processed shale in late October made it possible to develop a number of exploratory studies in the greenhouse. Plans for a major field season prompted us to propagate a large number of plants and prepare them for spring plants.

A high priority for writing a "state-of-the-art" paper on rehabilitating processed oil shale using native species with a minimum of cultural treatments required us to defer completion of the literature review of research relevant to rehabilitating processed oil shale. The report, prepared as a supporting document to the DDP, is in a sense our literature review although we still plan to complete the draft that was prepared earlier.

As soon as weather permitted, a major field planting effort took place in April. Subsequently, other studies have been initiated. Specific areas of effort are described briefly in the following paragraphs.

A. A bibliography on the propagation and establishment of perennial *Atriplex* was prepared by Mr. Kent Crofts as an adjunct to another project of the Institute for Land Rehabilitation. This bibliography will be useful in developing methods for using the three saltbush species native to the oil shale area for revegetating processed oil shale disposal areas.

B. Germination of *Atriplex* seeds is conditioned by the hard, thick utricle that encloses the seed. Seedling vigor appears to be related to seed size and utricle characteristics. Selection of small but filled seeds and thin-walled utricles should increase establishment success with local species of *Atriplex*.

C. Native shrubs grown in containers appear to be conditioned by the size and configuration of the container itself. During the greenhouse phase of a study, plant height appeared to be correlated with the volume of the container. Whether rooting characteristics of individual species are changed signficnatly by container size and shape will be tested in the field phase of the study during the next ten months.

D. Physiological studies indicate that several native shrub species grow well on fertilized, raw and processed oil shale with pH values up to 9. Higher pH's (e.g., 11.7 in one sample) inhibit plant growth. Shadscale and fourwing saltbush tolerate high salinity levels (osmotic potentials up to -25 atm) of NaCl and Na_2SO_4. Growth of shadscale is even enhanced by moderate salinity (-10 atm). Several species respond differently to different forms of nitrogen fertilizer (nitrate vs. ammonium) in processed oil shale and the responses are conditioned by the pH and salinity levels of the processed oil shale.

E. Rehabilitation plantings on disturbed sites have shown that superior results may be obtained by planting container-grown plants. Not all of the native species found on the oil shale tracts are suitable for any disturbed site. Soil texture, salinity, competing weeds and depth of bedrock may all dictate the choice of species for transplanting. A current study is designed to test the best season and planting methods for use in the area of oil shale in Utah.

F. Propagation of big sagebrush (*Artemisia tridentata*) by vegetative means is most effective in the spring when plant materials are still in a dormant stage. High rates of rooting hormone are necessary to promote rooting. Not all plants will root with the same degree of success; careful selection is necessary.

G. Three research proposals were prepared during the last six-month period. If funded, these proposals would expand our scope of research on oil shale in Utah. In addition to the proposals, three reports were published during the same period.

H. Plans for work in the next six-month period include development of a small pilot model of a processed shale pile. This study will help to determine water runoff, percolation, salinity movement and accumulation in the top three to four feet of a disposal pile. Other field studies will investigate soil surface stabilizing materials, root growth of container-grown plants and survival of plants outplanted in fall and spring. Laboratory studies will concentrate on plant growth on processed oil shale in relation to various salts and means to ameliorate the adverse effects of salinity and low fertility.

II. INTRODUCTION

During the past six months a considerable amount of work has been done in several areas of the research program. As we obtained results and increased our experience with the multiple problems of revegetating disturbed sites and processed oil shale, we gain confidence in our ability to provide rehabilitation recommendations. At the same time we are gaining new perceptions of some of the unsolved problems, such as the range of pH and salinity possible in processed shale, how to cope with the variability in weather on the tracts, how to propagate some native species by seeds or cuttings, the minimum fertilizer requirements of native plants, and determining the pattern of salinity movement or accumulation in surface areas (top three feet) of a processed shale disposal pile. We are currently working on some of these problems or have proposals for studies on them.

By their very nature, some of the problems involving plant growth under natural conditions will require adequate time to assess results before conclusions and recommendations can be formulated. Our research program is basically two-phased, field research on tracts Ua-Ub and Section 6, reinforced by greenhouse and laboratory research. Often the non-field studies are useful to work out details or relationships which must be tested under field conditions.

In this report we have examples of the mutually supportive nature of field and laboratory-greenhouse research.

III. LITERATURE REVIEWS

Previously we reported progress on a literature search of revegetation techniques, plant propagation, ecology of the salt desert shrub ecosystem and the physiological responses of native plants grown under stress conditions similar to those expected when grown on processed shale. An extensive search was conducted and a rough draft was written. However, other priorities, such as preparation of proposals, interferred with the final preparation of a manuscript suitable for publication. Instead, the draft was used in writing a "state-of-the-art" paper which accompanied the DDP for tracts Ua and Ub and in preparing two research proposals. More will be said about the research proposals in a later section.

A second literature review has been prepared by Mr. Kent Crofts in relation to an Agricultural Experiment Station project he is pursuing on the germination of *Atriplex* species. Three woody *Atriplex* species are found on tracts Ua and Ub which would be highly useful in a revegetation program because of their adaptability to site conditions (especially salinity) and for their usefulness as game and livestock feed. One of the problems with the species is their relatively hard seed covering (utricle) and low germinability and seedling vigor. The bibliography of published reports on germination and seedling vigor of *Atriplex* shrubs, prepared by Mr. Crofts, is provided as an appendix to this report (Appendix I).

IV. SEED COLLECTIONS OF NATIVE SPECIES

The seed collections of predominant species found in the vicinity of tracts Ua and Ub have been subject to threshing and cleaning during the past six months. Individual plant species required special techniques and equipment settings to separate seeds from chaff, etc. A record was made of the methods used and is retained in the project office for future reference. Most species collected have been prepared and are on deposit in a metal cabinet in the project office. Low humidity and relatively uniform temperatures should help to retain the viability of the seeds.

Seeds of species deemed to have a special interest for revegetation will again be harvested this year to assure an adequate supply. We have already responded to three requests for seeds from our collection. Such requests have come from other research workers and are expected to result in a reciprocal exchange of information.

V. STUDIES ON GERMINATION AND SEEDLING VIGOR OF *ATRIPLEX* SPECIES

Previous work with seed collection, seed cleaning and propagation of native saltbushes has shown the need for additional research on the factors involved in germination and establishment of these highly important and desirable revegetation species. Some of the factors involved in propagation of *A. confertifolia* (shadscale), *A. canescens* (fourwing saltbush), *A. cuneata* (cuneate saltbush), and *A. gardnerii* (Gardner saltbush) were studied. These four species are native to the oil shale region of the Uintah Basin and are considered extremely desirable for revegetation purposes.

Collections of seeds of the four saltbushes were begun in the summer of 1975. A series of experiments sponsored by Experiment Station Project 754 were designed to test fruit-related characteristics that might influence seed quality, germination, seedling vigor and ultimate plant survival were conducted in the laboratory and in the greenhouse at USU in Logan. The preliminary results of those experiments are reported below. Some statistical analyses remain to be done.

A. Seed Collection

An important aspect of plant propagation is the collection and proper handling of high-quality seed. To determine the optimum periods of time when high-quality seed can be collected to assure the highest possible certainty of success, seeds of the four saltbushes were collected over an eight-month time period.

Seed collections were made at the following locations: shadscale and fourwing saltbush were collected north of the Section 6 study site, cuneate saltbush was collected at Watson and gardner saltbush was collected at Manila. Seeds were collected at various dates of maturity to observe the effect of time on fruit fill, water soluable inhibitors present in the utricle and fruit size. The collections were made on the dates listed in Table 1.

Table 1. Dates of seed collection

Species	Aug 21	Sept 5	Oct 17	Dec 12	Jan 10	Mar 27
A. *confertifolia* (Atco)			X_B*	X	X	X
A. *canescens* (Atca)			X_B	X	X	X
A. *cuneata* (Atcu)	X_B	X	X	X	X	X
A. *gardnerii* (Atga)			X_B			

*Collections subtended by an upper case "B" represent bulk collections made to conduct an extensive series of seedling vigor studies in the laboratory at Logan.

B. Seed Cleaning

The seeds were collected in the field in paper sacks and placed in dry storage at room temperature. In December the seeds were dewinged by passing the fruits through a hammermill once and then cleaned by passing them through a clipper seed cleaner. Results of dewinging and cleaning are presented in Table 2.

Table 2. Effects of hammermilling through a 3/16" screen and subsequent cleaning on seed volume and weight.

Species	Initial weight*	Weight after cleaning*	% weight reduction	% volume reduction due hammermilling	% of original volume after cleaning
Atca	3.07 lbs	1.65 lbs	46	65	12
Atco	2.24 lbs	1.06 lbs	53	65	12
Atcu	1.92 lbs	1.60 lbs	17	35	72
Atga	1.37 lbs	1.09 lbs	21	38	81

*Bulk samples

Aside from the added ease in handling of saltbush seeds due to the reduction in weight and volume, hammermilling was found to separate the seeds from the fruits of all species evaluated. The possibility, therefore, exists that repeated hammermilling would result in a greater proportion of excised seeds and increase the possibility of improving field planting success by an increase in germination percentage.

C. Seed Sizing

After passing the dewinged fruits and chaff through the clipper cleaner until the chaff had been blown out, the fruits were sized by standardized seed screens that were inserted into the clipper cleaner. The screen sizes used in sizing the fruits and the weight measurements are reported in Table 3. Since previous studies have reported different sizes of fruits, an experiment was designed to test the possible relationships that might exist between utricle size, utricle wall thickness, seed weights, seed germination and ultimately, plant survival.

Fruit size varies considerably between different species of saltbushes. For example, the utricles of the largest fruits of gardner saltbush and

Table 3. The effects of fruit sizing on weight distribution of *Atriplex*.

Species	Seed Screen Size	Weight of fruits passing through the seed screen	% of bulk weight passing through the seed screen
Atca	1. < #8	0.30 lbs	22
	2. ≤ #9 > #8	0.41 lbs	31
	3. ≤ #10 > #9	0.31 lbs	23
	4. > #10	0.33 lbs	24
Atcu	1. ≤ #1/12	0.29 lbs	18
	2. ≤ #7 ≥ #1/12	0.26 lbs	16
	3. ≤ #9 > #7	0.67 lbs	42
	4. > #9	0.39 lbs	24
Atco	1. < #9	1.40 lbs	34
	2. ≤ #10 > #9	1.25 lbs	30
	3. ≤ #11 > #10	1.04 lbs	25
	4. > #11	0.44 lbs	11
Atga	1. < #7	0.64 lbs	26
	2. ≤ #8 > #7	1.01 lbs	41
	3. ≤ #9 > #8	0.44 lbs	18
	4. > #9	0.37 lbs	15

cuneate saltbush are about the same size as the smallest fruits of shadscale. It is also evident from the data that an obvious reason why several reported attempts at scarification have been unsuccessful on certain sizes of utricles.

D. Utricle Wall Thickness

Following cleaning, the fruits were analyzed to determine if any relationship existed between utricle size and thickness of the utricle wall. Such a possible relationship has been suggested by several researchers but information on this subject is lacking. To test the possibility of such a relationship a sample of 50 fruits from each size class were cut in two by fingernail clippers at a tangent to the axis to the fruit. Thickness of the utricle wall was measured by a Wild microscope with an ocular micrometer mounted in the eyepiece. Since the width of the fruitwalls was found to vary in each fruit, a point representing the average thickness was measured. Results of the thickness of utricle walls as it varies in relationship to utricle size are found in Table 4 and in Figure 1.

Table 4. The effect of utricle wall thickness as determined by utricle size.

Species	Screen Size	Utricle wall thickness in mm
Atco	1. < #9	0.3325
	2. < #10 > #9	0.4415
	3. < #11 > #10	0.5855
	4. > #11	0.5525
Atcu	1. < #1/12	0.4850
	2. < #7 > #1/12	0.3565
	3. < #9 > #7	0.4800
	4. > #9	0.5025
Atca	1. < #8	0.2825
	2. < #9 > #8	0.3700
	3. < #10 > #9	0.4150
	4. > #10	0.4700
Atga	1. < #7	0.2575
	2. < #8 > #7	0.3200
	3. < #9 > #8	0.4400
	4. > #9	0.5475

Although the data have not been statistically analyzed a trend exists whereby utricle wall thickness increases as the size of the utricle increases. The relationship is very evident for fourwing saltbush and gardner saltbush and also evident to a lesser degree in shadscale and cuneate saltbush. Several members of the research team have also observed a trend in *Atriplex* germinability ranging from easiest to hardest; fourwing saltbush ($\bar{x}$ wide .3844 mm), gardner saltbush ($\bar{x}$ width .3888 mm), cuneate saltbush ($\bar{x}$ width

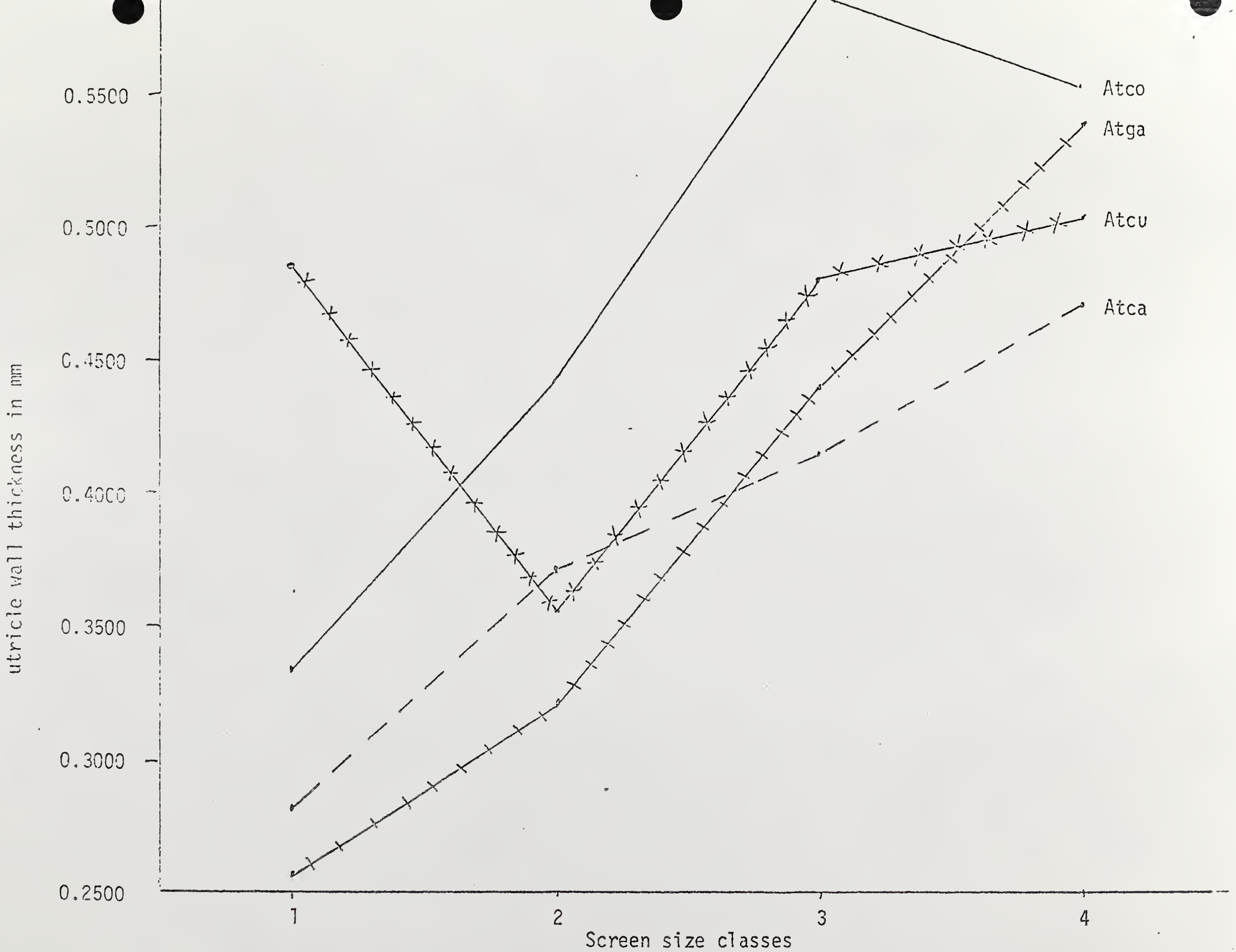

FIGURE 1. The effect of utricle wall thickness as determined by utricle size.

.4560 mm) and shadscale ($\bar{x}$ width .4780 mm).

Although several researchers have observed that a relationship between utricle wall thickness and utricle size exists, evidence now seems to indicate that fruit sizing in conjunction with scarification might significantly increase the success obtained in field plantings. Future work along this line will be continued.

E. Seed Weights as Affected by Utricle Size

In numerous species, seedling vigor and plant survival have been reported to relate directly to the size of the seed. There appears to be a dubious value to size the seeds of the four species of saltbush studied because of the overriding effect of the indurate utricle that surrounds the seed. As an alternative, a possible relationship between the size of the utricle and the weight of the seeds was postulated. To test the possible relationship between these two variables a study was designed to utilize the bulk lot of seeds previously sized for the studies on seed cleaning and utricle wall thickness. To effectively excise the seeds from the indurated fruiting bracts a rub board having a corrugated vinyl plastic bottom was constructed. A small handfull of fruits was placed on the rub board and rubbed a couple of times. The excised seeds were then very easily removed from the chaff by means of a pair of tweezers and weights of individual seeds were measured on a Mettler Model H20T Analytical Balance to a five decimal place accuracy. Two hundred seeds of each utricle size class were weighed, except for shadscale where three hundred seeds for each size class were weighed. The weights obtained from each utricle size class are reported in Table 5 and Figure 2.

Table 5. Utricle size in relation to excised seed weight.

Species	Screen Size	Seed Weight in mg	Species Average
Atco	1. < #9	0.93	1.30
	2. < #10 >#9	1.21	
	3. < #11> #10	1.52	
	4. > #11	1.55	
Atcu	1. < #1/12	0.57	.97
	2. < #7 >#1/12	0.72	
	3. < #9 >#7	1.17	
	4. > #9	1.40	
Atca	1. < #8	1.12	1.62
	2. < #9 >#8	1.39	
	3. < #10> #9	1.88	
	4. > #10	2.08	
Atga	1. < #7	1.30	1.82
	2. < #8 > #7	1.76	
	3. < #9 >#8	2.10	
	4. > #9	2.12	

It is evident from the four species studied that seed weight increases as the size of the utricle increases. The practical value of this is in the possibility of selecting for seedling vigor on the basis of utricle size. If such a process of selection could be developed it would increase the chances of field establishment and survival. Such a selection process has been used for many years with important crop species but relatively little has been done with native plants.

To determine the relationship between early growth response and different utricle sizes, an experiment was designed to evaluate germination and seedling vigor. Eight root observation chambers 120 cm long were constructed and filled with an inert, coarse, washed, masonry sand to a depth of 15 cm. Excised seeds that had previously been used to determine seed weights were examined under a microscope to verify that no breakage had

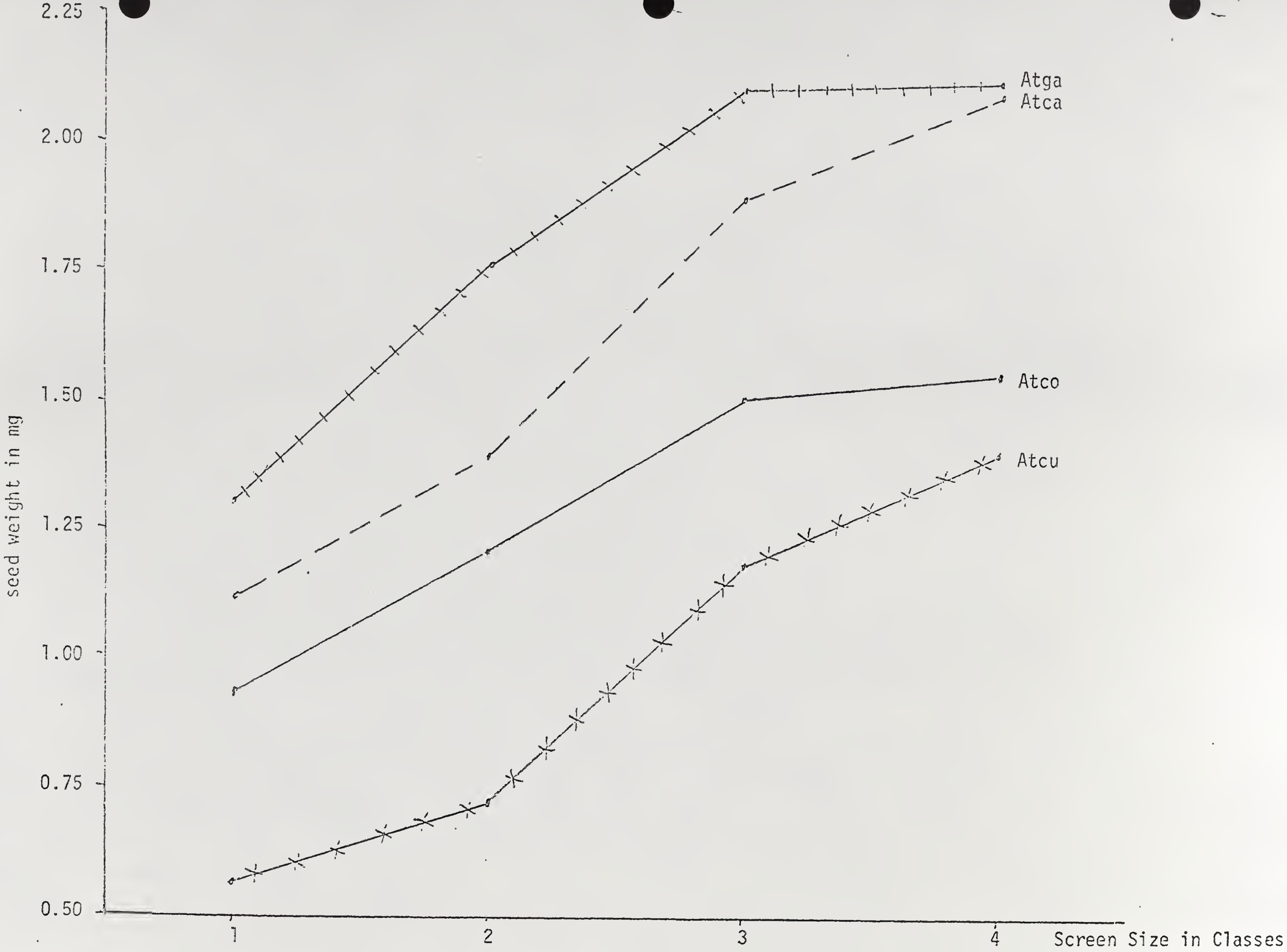

FIGURE 2. Utricle size in relation to excised seed weights.

occurred during rubbing. Only those seeds that were structurally intact were planted. Seeds were planted one-half cm deep and one-half cm apart. Three replications of 60 seeds for each species were observed daily to measure the rate of germination. Radicle length was measured after seven days and again at the conclusion of the 2-week observation period. Shoots were measured at the end of the study and a determination was made as to whether or not the plant was still alive.

Germination of excised seeds closely followed a relationship with the thickness of the utricle wall (Table 6). No trend was evident between germination percentages and utricle size. For three of the four species being evaluated, the lowest germination percentage recorded was for the largest size class, while the highest germination observed for three of the four was for the smaller utricle sizes. Even though it has been almost a universally accepted principle that larger seeds give the highest germination percentages, this dictum does not hold true for the four saltbush species studied. Evidence strongly suggests that polymorphic factors not clearly understood at the present time are partially responsible for differences in germination percentages relative to greater utricle size.

The results obtained for radicle growth were more clear cut. Two of the four species showed progressively shorter radicle lengths as the utricle size increased (Table 7). Maximum radicle length for three of the four species occurred at those utricle sizes having the thinnest utricle walls.

Table 6. Germination percentages of four species of perennial *Atriplex* as based on utricle size.

Species	Rep I	Rep II	Rep III	Size Class	Species Ave.
Atca 1	95	98	72	88	81
Atca 2	83	93	100	92	
Atca 3	77	68	68	71	
Atca 4	57	70	87	71	
Atcu 1	72	78	88	79	71
Atcu 2	68	68	85	74	
Atcu 3	82	83	67	77	
Atcu 4	62	58	40	53	
Atga 1	85	97	100	94	87
Atga 2	92	92	75	86	
Atga 3	100	100	90	97	
Atga 4	63	63	87	71	
Atco 1	65	68	63	65	28
Atco 2	3	10	5	6	
Atco 3	23	18	28	23	
Atco 4	15	27	12	18	

Table 7. Total radicle lengths in mm of four species of *Atriplex* over a two-week observation period.

Species	Rep I	Rep II	Rep III	Size Class	Species Ave.
Atca 1	14.4	11.6	18.7	14.9	11.7
Atca 2	14.3	20.8	7.7	14.3	
Atca 3	12.7	8.0	11.8	10.8	
Atca 4	4.7	3.4	12.7	6.9	
Atcu 1	2.8	5.2	10.8	6.3	5.6
Atcu 2	6.4	7.7	7.4	7.2	
Atcu 3	6.1	5.3	5.8	5.7	
Atcu 4	2.3	3.3	3.5	3.0	
Atga 1	8.7	4.6	14.3	9.2	7.4
Atga 2	8.2	7.3	10.0	8.5	
Atga 3	7.1	6.8	5.4	6.4	
Atga 4	5.3	5.2	6.3	5.6	
Atco 1	2.4	3.4	1.7	2.5	3.3
Atco 2	4.5	3.5	3.7	3.9	
Atco 3	3.6	4.8	2.8	3.7	
Atco 4	4.7	2.6	1.7	3.0	

Fourwing saltbush and gardner saltbush both responded similarly with a progressive decrease in total radicle length as seed weight increased. A similar trend was demonstrated by cuneate saltbush but not for shadscale. The four saltbush species averages for radicle length followed the same ranking of fourwing, gardner, cuneate and shadscale based on germinability of whole fruits and thickness of the utricle wall.

During the seedling vigor study a considerable number of the emergent seedlings died as a result of preemergence damping-off fungus. To evaluate the effect of this pathogen on plant survival measurements were taken to see if any correlation existed between the characteristics of germination and plant mortality (Table 8).

Table 8. Percent mortality of germinated seeds by utricle size class.

Species	Rep I	Rep II	Rep III	Size Class	Species Ave.
Atca$_1$	59.6	32.2	51.2	47.7	64.0
Atca$_2$	84.0	58.9	20.0	54.3	
Atca$_3$	100.0	82.9	41.5	74.8	
Atca$_4$	94.2	92.9	50.0	79.0	
Atcu$_1$	25.6	31.9	39.6	32.4	32.2
Atcu$_2$	7.3	7.3	7.8	7.5	
Atcu$_3$	67.3	46.0	5.0	39.4	
Atcu$_4$	29.7	60.0	58.3	49.3	
Atga$_1$	29.4	36.2	3.0	22.9	43.3
Atga$_2$	56.4	69.1	40.0	55.2	
Atga$_3$	51.7	20.0	42.6	38.1	
Atga$_4$	81.6	57.9	30.8	56.8	
Atco$_1$	0.0	9.8	0.0	3.3	8.3
Atco$_2$	0.0	0.0	0.0	0.0	
Atco$_3$	24.4	36.4	0.0	19.3	
Atco$_4$	0.0	31.3	0.0	10.4	

Although few conclusions can be drawn at this time from the above data that apply to all four species, a trend exists for plant mortality to increase as seed weights, utricle size and utricle wall thickness increases. A similar trend is less evident with cuneate saltbush and no apparent trend can be detected for gardner and shadscale saltbush.

Few conclusions can be formulated at this time but selection for certain seed characteristics in *Atriplex* have the possibility of influencing seedling vigor. Many facets of this project have been completed but have not yet been analyzed. A full and complete summary of this project will be reported in the next biennial report.

VI. EFFECT OF CONTAINER SIZE AND SHAPE ON ROOT GROWTH OF NATIVE SHRUBS

The philosophy behind the use of containerized plants for revegetation is to assure plant establishment in an arid environment. At the time of planting, containerized transplants have a mass of soil around the roots. The soil mass protects the roots from damage and desiccation during the planting process. Also, the soil mass contains enough moisture and nutrients to help sustain the plant until the roots can explore the new soil for needed moisture and nutrients.

However, there are some problems with root growth of native shrubs in containers that have to be overcome to insure successful containerized plantings. One such problem is the container itself. The configuration of the container will dictate the growth of the root system to become malformed or to "ball up". The malformed root system may cause a decrease in plant growth or even premature death after outplanting because the roots cannot expand and explore the soil for needed moisture and nutrients. Another problem associated with containers is that they may inhibit plants from growing which have a shallow, lateral root system and spread by rhizomes. The container may force the roots and rhizomes to grow down in a concentrated mass so they cannot spread after outplanting.

Thus a study was designed to determine the optimum container type for native shrubs with particular rooting habits.

A. Objectives

1. To study the influence of container configuration on producing a malformed root system.
2. To evaluate the field performance of container-grown plants.

3. To compare the growth of seedlings and rooted cuttings in containers during greenhouse propagation and after outplanting.

B. Methods

The three shrubs used in the study are: greasewood (*Sarcobatus vermiculatus*), which has a deep tap root growth; fourwing saltbush (*Atriplex canescens*), which has a tap root and lateral root growth; and spreading rabbitbrush, (*Chrysothamnus linifolius*) which has a lateral root system and reproduces readily by rhizomes.

Four different containers will be used. They are described as follows:

- bullet - These containers are a circular, plastic container 15 cm long with a 2.5 cm diameter. This container allows for air root pruning at the end.

- deep - This is a tubular container made of thin plastic film reinforced with cotton string. Tubes are 43 cm long and 5 cm in diameter.

- milk carton - This is a regular one-quart milk carton. The bottom is closed so that the roots will be confined. Two holes were punched to allow for water drainage.

- tubepack - These containers consist of five tubes connected together in one unit. The containers have vertical grooves on the inside which cause the roots to grow straight down. The bottom is designed for air root pruning. Individual containers are 4 cm x 5 cm x 18 cm.

During January 1976 both seedlings and cuttings of each species were planted in each container type. Proper greenhouse procedures were followed to prepare the plants for transplanting. On June 29 and 30 the plants were then outplanted in the study site near Bonanza, Utah.

Figure 3 shows the randomized block design for the experiment. There are 24 treatments replicated ten times. Four of the replications were instrumented with soil psychrometers for measurement of moisture. Each psychrometer was buried 30 cm deep and 15 cm from the plant. Soil moisture measurements are expected to indicate how fast the roots explore the soil for moisture. Psychrometer readings will be taken every two weeks during the summer and fall of 1976 and the spring of 1977.

C. Results

Container type has a large influence on plant growth prior to outplanting (Figure 4). Generally the more restrictive containers resulted in shorter outplanting stock. Rooting characteristics varied according to container type (Table 9). There was little variation between species in any one container type. The greatest variation was between container types. It can be concluded that the container does influence the growth and shape of the root mass. Whether this is harmful to plant performance in the field will be determined by results from the field study.

STA	CDS	STC	CDC	SBS	SDC	CMC	SMS	SDA	SDS	SBA	SMS	CMA	CBC	CDA
SDC	SBS P	CMS	CDS	STC	STA	CBC	SMC	SBS	CDA	SMA P	CMC	SMS	SBC	SDA
STS	CBA	CDA	CMS	CTS	CTA	CBS	STA	CTS	SBC	SMC	CBS	SMA	STS	SBS
CMA	CDC	SDA	SBC	CMA	CBS	CTA	CMA	CBA	CTA	CTS	CTC	CBS	STA	CBA
CTC	CTS	CTA	SMS	CBA	SDA	CMS	CDC	STC	SDA	CDC	CMA	CMS	CDC	SBA
CBS	SMS	SBC	STS	SDS	CTC	CDS	SDC	SBC	CDA	CBC	STS	CTC	CDS	CMC
CMC	SMA	SMC	SBA	SMA	CDA	STS	SDS	CDA	SDS	CMC	SBS	CTA	STC	SDC
CBC	SBA	SDS	SMC	CBC	CMC	SMA	SBA	CTC	STC	CDS	STA	SDS	SMC	CTS
	8			5			7			2			6	

SDC	CDS	STC	CTA	SDS	CDC	STA	SBS	SDC	CBS	SDA	CDC	STA	CDA	CTS
STA	CMS	CBC	SDC	STA P	CMA	STS	CBA	CDA	STS	SMS P	SDS	SDA	STC	SDC
SMC	SMA	CMC	SMS	STC	CDA	CMA	SDA	CDC	CDA	CMS	CTA	CTA	SMS	SDS
SMS	CBS	CMA	CMC	SMC	CBA	CTC	CTS	CTA	SBS	SMA	SBA	CDC	CMA	CBS
SBC	CTA	CTS	CTC	CDS	CMS	CBS	SMS	SBC	CTC	CBA	CBC	SMC	SBC	CMS
SDA	CDC	CDA	SBA	CBS	SBS	CMS	CBC	CDS	STC	STA	SMC	CTC	SMA	CDS
CBA	STS	CTC	STS	SMA	CBC	SMA	STC	SMC	SDC	CDS	CMC	STS	SBS	CMC
SDS	SBA	SBS	SDA	SBC	CTS	CMC	SDS	SBA	CMA	CTS	SBC	CBA	CBC	SBA
	4			3			1			10			9	

Plant Type	Container Type	Species
C - cutting	B - bullet	A - Atriplex canescens
S - seedling	D - deep	C - Chrysothamnus linifolius
	M - milk carton	S - Sarcobatus vermiculatus
	T - tubepack	

P - replications which have soil psychrometers

FIGURE 3. Experimental design

Table 9. Description of the Root Growth in Each Container Type.

ATRIPLEX CANESCENS Seedling	Good root growth. Roots grew straight down, however, roots became balled up at opening for air pruning	Tap root twisted length of container. Secondary roots grew circular on outside of soil plug. Roots became balled up at bottom. Good root growth	Most of the roots grew down the corners of the container. Then became packed at bottom in a square shape. Excellent root growth.	Grooves direct root growth straight down with air pruning occurring
Cutting	Moss and algal growth was found on roots. Roots were twisted somewhat the length of container. Good root growth	Good root growth. Some twisting of roots as they grew the length of container. 1 roots was larger than others. May become the tap root.	Excellent root growth. Roots grew down corners of containers and became "square"shaped at bottom.	Grooves direct root growth downward. Roots clustered a opening for air pruning. Th was good root growth in container.
CHRYSOTHAMNUS LINIFOLIUS Seedling	Excellent root growth in soil plug. Roots grew somewhat straight down the container length. Became balled up at opening for air pruning. Some root sprouting.	Tap root twisted length of container with circular growth of secondary roots.	Most of root mass grew down corner of container into a "square" at the bottom. Excellent root growth. Root sprouting was also observed.	Roots grow in grooves and were air pruned with some root balling occurring. Good root growth.
Cutting	Good root growth. Roots grew straight down. Little or no circular growth was observed. Algal growth was on roots. Some roots sprouting.	Roots twisted length of container. They became balled up at bottom, however. Good root growth,	Excellent root growth. Most roots grew in corner of container became "square" shaped at bottom. Some root sprouting was observed.	Moss and algal growth on roots. Good root growth. Roots air pruned and growing in grooves.
SARCOBATUS VERMICULATUS Seedling	Some twisting of tap root as it grew downward. Some circular growth of secondary roots. Roots became interwoven at opening for air pruning.	Fair root growth. Roots grew length of container. No circular growth was observed. Tap root was not observed.	Good root growth. Roots were "square" shaped at bottom. Did not observe tap root.	Roots grew nicely in grooves Roots were air pruned with little balling up occurring. Moss and algal growth was found on soil plug.
Cutting	Poor root growth. Roots were find and fiberous. Roots did not hold soil plug together.	Roots poorly developed. Fine and fiberous. Did not hold soil plug together.	Fair root growth. Roots were fine and fiberous-like. Roots were shaped by container. The root mass became "square"shaped at bottom.	Roots riberous and sparse. Grooves directed root growth straight down. Rotts were air pruned.

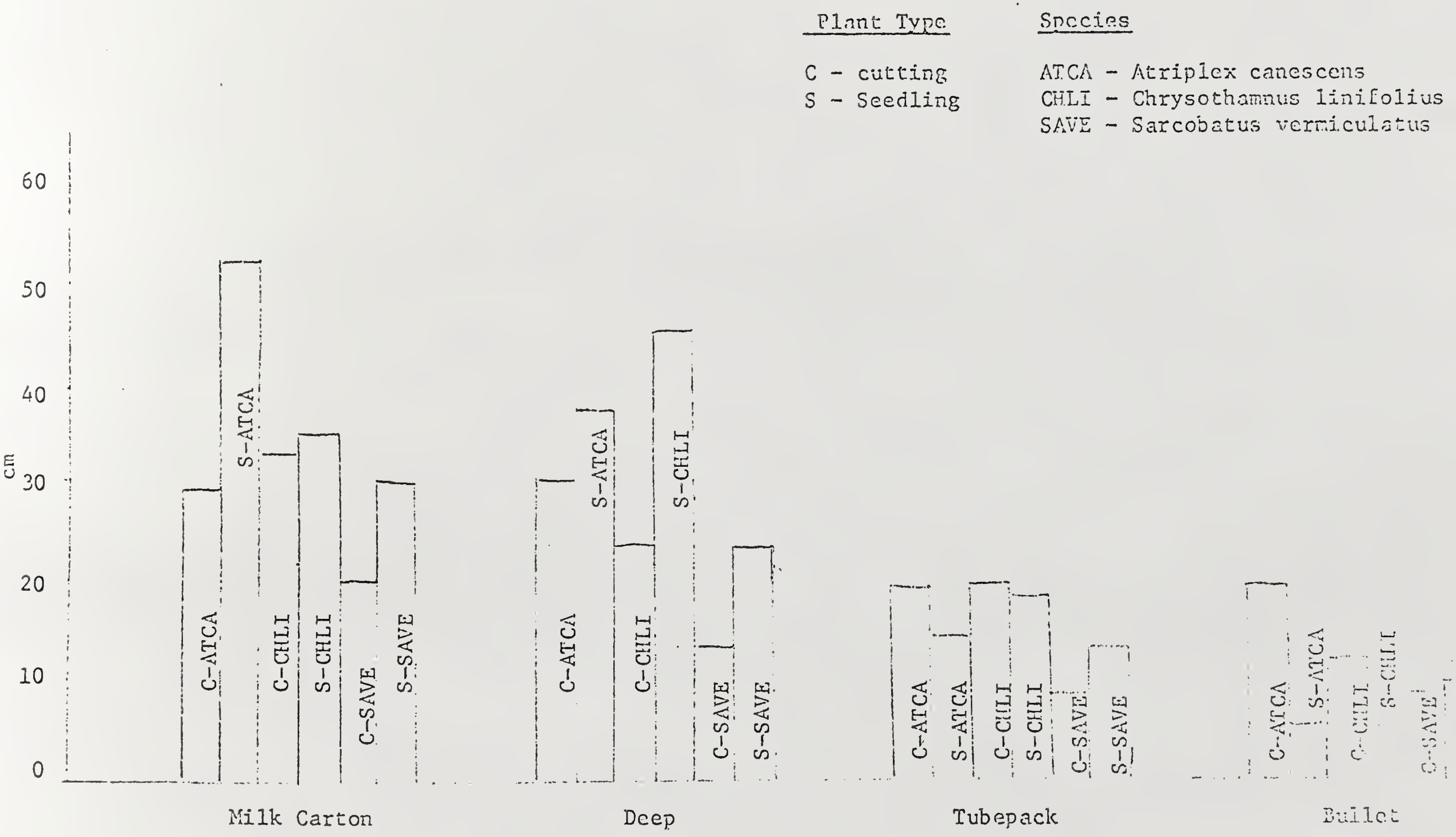

FIGURE 4 . Average top growth of plants in specific containers.

VII. PHYSIOLOGICAL STUDIES OF NATIVE PLANTS GROWN IN PROCESSED SHALE.

A number of problems have been identified which require preliminary study under controlled conditions. These problems are mostly related to the salinity, the pH, and the specific chemical nature of processed shale. Recent availability of processed shale from Utah has stimulated research to compare plant growth in this medium with growth measurements reported by researchers in Colorado.

Studies reported in this section include: a comparison of the chemical properties of soil, processed Colorado and Utah shale and raw shale; growth of greasewood (*Sarcobatus vermiculatus*) and cuneate saltbush (*Atriplex cuneata*) in raw and processed shale; fertilization of cuneate saltbush, mat saltbush (*Atriplex corrugata*) and winterfat (*Ceratoides lanata*) with ammonium and nitrate forms of nitrogen; a comparison of cuneate saltbush, mat saltbush and winterfat growth in processed shale from Utah and Colorado; the effect of chloride versus sulfate ions on the leaf growth and water use of shadscale (*Atriplex confertifolia*); and a companion study of the same ions on leaf growth and water use of fourwing saltbush (*Atriplex canescens*). These studies all seek to clarify salinity relationships involving processed shale and the growth of some of the most salt-tolerant shrubs found in the oil shale region. Results from the greenhouse studies will guide the development of a pilot model of the shale disposal pile with water harvesting and topsoil trench as activities to be evaluated.

The greenhouse experiments were performed using untreated (except as indicated in each experiment) Paraho processed oil shale, raw oil shale or soil in plastic-lined quarter milk cartons or plastic 24-ounce cottage cheese tubs. The containers had no drain holes so there would be no leaching of salts from the containers. Water was added by weight, using a heavy-duty solution balance, so that a predetermined soil moisture level could be maintained throughout each experiment.

Analyses performed by the USU Soils Lab of the processed oil shale, soil, and raw oil shale samples used in the greenhouse experiments appear in Table 10. Two samples of processed Colorado oil shale were used and are identified as sample #1 or #2. Both the processed and raw (unprocessed) Utah oil shale samples (one sample each) were collected from Hell's Hole Canyon. The raw Utah oil shale was crushed in a ball mill at the U.S. Bureau of Mines laboratory in Salt Lake City, Utah, and the processed Utah oil shale was retorted at the Paraho facility in Colorado. The topsoil used in all but one of the greenhouse experiments was collected from a shadscale (*Atriplex confertifolia*) community located partway between Bonanza, Utah and the federal oil shale lease tracts Ua and Ub. It is called Bonanza soil in the soil analysis reports. In one experiment a non-saline, sandy loam soil from Cache Valley, Utah was used (no analysis available).

The pH of the two processed Colorado oil shale samples is 9, while the pH of the processed Utah oil shale sample is 11.7. The high pH of the Utah sample is believed to be a result of the processing and not of the Utah oil shale characteristics per se. The pH of raw (unprocessed) Utah oil shale is 7.7. Work in Colorado (Schmehl and McCaslin, 1973; Berg, 1973;

Schmehl, W.R. and B.D. McCaslin. 1973. Some properties of spent oil shales significant to plant growth, pp 27-43. In Hutnik, R.J. and G. Davis [eds] Ecology and Reclamation of Devastated Land, Vol. I. Gordon & Breach, New York.

Berg, W.A. 1973. Chemical analysis of TOSCO II processed shale and their interpretations relative to plant growth, pp 115-127. In Bloch, M.B. and P.D. Kilburn [eds]. Processed Shale Revegetation Studies, 1965-1973. Colony Development Operation, Atlantic Richfield Co., Denver, Colorado.

Table 10. Analysis of soil and shale samples used in greenhouse studies.

	Soluble ions (1:1 extract) me/100g									
	Na^+	K^+	Ca^{++}	Mg^{++}	$SO_4^=$	Cl^-	HCO_3^-	$CO_3^=$	pH	B ppm
Bonanza Soil	1.0	.1	.1	.3	.2	.3	.6	0	7.6	.9
Processed Colorado Oil Shale #1	6.9	.6	1.4	1.9	11.1	.1	.2	0	9.0	.7
Processed Colorado Oil Shale #2	3.96	.09	.68	2.80	5.2	.04	.2	0	9.0	.88
Raw (unprocessed) Utah Oil Shale	.8	-	-	-	-	-	-	-	7.7	10.8
Processed Utah Oil Shale #1	1.30	.25	.57	.01	1.5	.23	.7	.5	11.7	.21

	Soluble ions (1:10 extract) me/100g							
Processed Colorado Oil Shale #2	6.09	.28	1.65	3.77	7.5	.06	6.7	0
Processed Utah Oil Shale #1	1.70	.33	3.80	.06	4.1	.34	2.9	4.6

	Extractable (NH_4OAc) Cations me/100g			NO_3^- ppm	P ppm	K ppm	Fe ppm	Zn ppm	CEC me/100g	%N
	Na^{++}	Ca^{++}	Mg^{++}							
Processed Colorado Oil Shale #1	6.0	36.3	15.2	.3	4.4	290	54	18.7	4.8	.18
Bonanza Soil	5.3	35.6	2.7	130	21	297	6	7.8	11.3	.11
Raw (unprocessed) Utah Oil Shale	1.1	25.8	.9	6.1	1.5	70	53	2.5	1.8	.37

and Striffler, Wymore and Berg, 1974) has shown that the pH of processed oil shale increases as the processing temperature increases.

The boron content of raw Utah oil shale is high but is apparently reduced to levels similar to the soils of the region by processing. The nitrate and available phosphorus contents of processed oil shale appears to be extremely low, but potassium is in sufficient supply. Iron and zinc are also adequate.

A. Growth of *Sarcobatus vermiculatus* (greasewood) in fertilized and unfertilized processed oil shale, raw (unprocessed) oil shale and desert soil.

To test the ability of *Sarcobatus vermiculatus* seedlings to grow in processed oil shale, one-quart milk cartons lined with polyethylene bags were filled with 1300g of either soil from a shadscale site (Bonanza soil), crushed raw (unprocessed) oil shale from Hell's Hole Canyon, processed Colorado oil shale sample #1 (crushed to pass through a 1/2-inch mesh screen) or processed Colorado oil shale sample #1 (1/2-inch screen) plus 1 gram NH_4NO_3(34-0-0) and 1 gram treble super phosphate (0-45-0). One-hundred-fifty grams of water was then added to each pot. The raw (unprocessed) oil shale was difficult to wet, so it was necessary to mix the water and raw oil shale mechanically before adding the mixture to the pots. One-hundred grams of clean sand was placed on top of the moist soil or shale and *Sarcobatus vermiculatus* seeds were planted in the sand. The purpose of the sand was to provide a buffer zone against salinity to insure good seed germination. Water was added daily to bring the total weight of each pot plus growth medium to 1600g (12 percent soil moisture).

Striffler, W.D., I.F. Wymore, and W.A. Berg, 1974. Characteristics of spent shale which influence water quality, sedimentation, and plant growth medium, pp 180-227. In Cook, C.W. [coord] Surface Rehabilitation of land disturbances resulting from oil shale development. Env. Res. Cen. Tech. Rep. Ser. No. 1, Colorado State Univ., Ft. Collins.

Table 11 shows the fresh weights, dry weights and ratio of fresh to dry weights of leaves of *Sarcobatus vermiculatus* seedlings harvested 135 days after planting. All data are the means of six replications.

Table 11. Growth of *Sarcobatus vermiculatus* (greasewood) in processed oil shale, raw (unprocessed) oil shale, and desert soil.

	Fresh Weight	Dry Weight	Fresh/Dry
Soil	3.603 g	0.478 g	7.482
Processed shale, fertilized	1.729	0.246	6.782
Processed shale	0.071	--	--
Raw (unprocessed) shale	0.085	--	--

Leaf production on soil was double that on fertilized processed oil shale and the leaves were more succulent (greater ratio of fresh to dry weight). Leaf growth of plants in fertilized processed shale was good, however (over 20 times that of plants in unfertilized processed or unfertilized raw oil shale). A cursory observation revealed that root growth was good in both soil and fertilized processed oil shale. A few extra containers of unfertilized processed oil shale and unfertilized raw oil shale with stunted seedlings were each fertilized (as above) at the time the plants of Table 12 were harvested. The growth rate of these *Sarcobatus vermiculatus* seedlings soon increased markedly. It is evident from this experiment that the addition of fertilizer is necessary for growth of *Sarcobatus vermiculatus* and probably other species on processed oil shale. Further research is needed to determine the actual fertility levels required by salt desert shrub species which are generally adapted to soils of low fertility.

Table 12. Growth of *Atriplex cuneata* in highly alkaline processed oil shale and raw, unprocessed oil shale from Hell's Hole Canyon.

Treatment	Height
Raw Shale (pH 7.7)	24.3 cm
Processed Shale (pH 11.7)	9.4 cm

B. Growth of *Atriplex cuneata* in processed Utah oil shale and raw unprocessed) Utah oil shale.

Utilizing the Paraho method of extracting kerogen from oil shale necessitates the removal and stockpiling of the fine raw oil shale particles. Raw oil shale piles, as well as processed oil shale piles, must be stabilized by vegetation. The following experiment was designed to study the growth of *Atriplex cuneata* on both raw and processed Utah oil shale. Any differences in growth on the raw or processed oil shale samples must be due to the processing since both samples were collected from the same shale outcroppings in Hell's Hole Canyon.

Eight 24-ounce cottage cheese cartons were filled with 800g ground raw Utah oil shale, collected from Hell's Hole Canyon and eight cartons were filled with 800 g Paraho processed Utah oil shale (also from Hell's Hole Canyon). Twenty-five ml of a one percent (by weight) Alconox detergent solution was added to each pot to improve the wetability of the shale (particularly the raw, unprocessed oil shale). Rooted *Atriplex cuneata* cuttings in peat pellets were planted directly in the shale (one cutting per pot) and each pot was fertilized with 0.25g NH_4NO_3 and 0.25g treble super phosphate. Water was then added by weight to produce a soil moisture level of 18 percent which was maintained by daily weighing and watering.

Initially, growth occurred in both the raw and processed oil shale treatments, but the *Atriplex cuneata* plants in the processed oil shale soon ceased growing and many of the leaf tips and margins became necrotic (brown or "burned"). After seven weeks the mean height of the plants in raw oil shale was 2.5 times that of the plants on processed oil shale (Table 13).

Table 13. Height of *Atriplex cuneata*, *Atriplex corrugata* and *Ceratoides lanata* after 30 days in processed Utah and Colorado oil shale.

	Processed Utah shale (pH 11.7)	Processed Colorado shale (pH 9.0)
Atriplex cuneata	5.3 cm	13.4 cm
Atriplex corrugata	3.5 cm	8.2 cm
Ceratoides lanata	10.1 cm	17.8 cm

The obvious and most likely reason for poor growth of *Atriplex cuneata* on the processed oil shale is the high pH (11.7). It is also possible that the retorting may have produced other chemical or physical changes in the shale that are inhibitory to growth. In this and other experiments using this highly alkaline sample of processed Utah oil shale it was observed that the shale tended to "set up" (become hard). This may have inhibited root growth into the shale.

C. Response of *Atriplex cuneata*, *Atriplex corrugata* and *Ceratoides lanata* cuttings to ammonium and nitrate forms of nitrogen in highly alkaline (pH 11.7) processed oil shale.

Past experience and several scientific articles suggest that various plant species differ in their ability to utilize the ammonium (NH_4^+) and nitrate (NO_3^-) forms of nitrogen. Since little is known about the actual fertility needs of salt desert shrub species it was decided that, in addition to testing the ability of three species to grow on processed Utah oil shale, their responses to NH_4^+ and NO_3^- would also be studied.

Twelve-hundred grams of air-dried processed Utah oil shale screened with a 1/2-inch mesh screen, was placed in each of 30 one-quart milk cartons lined with plastic bags. One-hundred grams of water was then added and 10 me each of $NaNO_3$ and NaH_2PO_4 were added to the other half. Rooted cuttings of *Atriplex cuneata, Atriplex corrugata* and *Ceratoides lanata* in peat pellets were placed on top of the shale, and 100 grams of clean sand was poured around each peat pellet. Water was added daily to maintain a soil moisture of 18 percent.

After two weeks in the greenhouse all the plants in the ammonium phosphate treated shale were dead. The plants in the sodium nitrate plus phosphate treated shale were still alive and healthy. After four weeks, however, only three *Atriplex cuneata* plants, two *Ceratoides lanata* plants and one *Atriplex corrugata* plant were still alive in the nitrate treated shale. The only difference between the two fertilizer treatments were the forms of nitrogen (NH_4^+ vs. NO_3^-) and the addition of sodium with the nitrate treatment. Since the processed oil shale is already high in sodium, it is unlikely that the addition of sodium would have a great effect on the growth of the above salt-tolerant shrub species. Apparently, NH_4^+ was either toxic or less available for growth than NO_3^-. Toxicity is a real possibility since at pH 11.7, NH_4^+ is largely converted to ammonia (NH_3) (DuPleiss and Kroontje, 1964). NH_3 at concentrations of only 0.15 to

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DuPleiss, M.C.F. and W. Kroontje, 1964. The relationship between pH and ammonia equilibria in soil. Soil Sci. Soc. Amer. Proc. 28:751-754.

0.20 millimoles/liter have been shown to be toxic to seedlings of several crop species (Bennett and Adams, 1970), and NH_3 can inhibit uptake of water by sugar beet roots (Stuart and Haddock, 1968). A pH level of 11.7 is extremely high and is likely responsible for the high plant mortality in the nitrate treatment. Further research is planned to study in greater detail the effects of forms of nitrogen fertilizer and pH on the growth of several salt desert shrub species in processed oil shale.

D. Response of *Atriplex corrugata* cuttings to ammonium and nitrate forms of nitrogen in highly saline processed oil shale.

As a sequel to the previous experiment with a highly alkaline medium, it was decided that a test of the effects of NH_4^+ and NO_3^- on plant growth in a highly saline but lower pH sample of processed oil shale should be performed. The surface layer of an exposed pile of processed Colorado oil shale (sample #2) having a white salt crust was removed and screened through a half-inch mesh screen. Eight-hundred grams of the air-dry shale passing the screen were placed in each of ten 24-ounce cottage cheese cartons. Rooted cuttings of *Atriplex corrugata* in peat pellets were planted directly in the processed shale. Five me (milliequivalents) of $NH_4H_2PO_4$ were added to five pots and 5 me $NaNO_3$ and 5 me NaH_2PO_4 were added to the other five pots. The pots had no drain holes and water was added daily by weight to maintain a soil moisture level of 18 percent.

After 20 days in the greenhouse only one of the five cuttings of *Atriplex corrugata* receiving ammonium form of nitrogen was still alive and it was in very poor condition. All the *A.corrugata* cuttings that received

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Bennett, A.C. and F. Adams. 1970. Concentration of NH_3 (aq) required for incipient NH_3 toxicity to seedlings. Soil Sci. Soc. Amer. Proc. 34:259-263.

Stuart, D.M. and J.L. Haddock. Inhibition of water uptake in sugar beet roots by ammonia. Plant Physiol. 43:345-350.

the nitrate form of nitrogen were alive and in fairly good condition. At pH 9 the ammonium ion (NH_4^+) is partially converted to ammonia (NH_3) which may have been toxic to the *A. corrugata* cuttings. This possible toxicity may have been enhanced by the high salinity of the salt-encrusted shale used used in the experiment. The above interpretation is only tentative at this time, but the results do suggest caution in the use of ammonium salts or anhydrous ammonia as nitrogen fertilizer on processed oil shale. Further research is planned to test the response of several plant species to various application rates of several forms of nitrogen fertilizer (e.g. urea, ammonium sulfate, ammonium nitrate, calcium nitrate and potassium nitrate) in processed oil shale. In addition, the pH of several processed oil shale samples will be reduced with H_2SO_4 to determine if pH does interact with the various forms of nitrogen fertilizer. The interaction of various salinity levels with nitrogen and phosphorus fertilizers will also be studied.

E. Growth of *Atriplex cuneata, Atriplex corrugata* and *Ceratoides lanata* in processed Utah and Colorado oil shale.

To compare the growth of three species on processed oil shale samples with different pH's, cottage cheese cartons were filled with 800 g of quarter-inch screened, air-dried processed Utah or Colorado oil shale (sample #2). The highly alkaline (pH 11.7) sample of processed Utah oil shale required mechanical mixing with water to insure complete wetting, but mixing was not necessary with the processed Colorado oil shale sample (pH 9.0). Rooted cuttings of *Atriplex cuneata, Atriplex corrugata* and *Ceratoides lanata* (one cutting per pot and five pots of each species per treatment) in peat pellets were planted directly into the processed shale. Five me (milliequivalents) of $NH_4H_2PO_4$ and five me of $NaNO_3$ were applied to each pot. A soil moisture level of 18 percent was maintained by daily weighting and watering.

After 30 days very little or no growth had occurred in the plants in the processed Utah oil shale and several of the *Atriplex corrugata* and *Ceratoides lanata* plants were dead or dying. All the plants in the processed Colorado oil shale were healthy and had approximately doubled in height (Table 13).

These results further implicate excessive pH as the probably reason for poor growth on the processed Utah oil shale. Reduction of the pH of the processed Utah oil shale sample with sulfuric acid should increase plant growth unless the processing has led to the formation or liberation of some toxic substance not found in the raw Utah oil shale or the processed Colorado oil shale samples. The presence of NH_4^+ in the processed Colorado shale was not detrimental to plant growth in this experiment as in two previous experiments. Some possible reasons are: 1) the pH was lower than in the processed Utah shale, 2) the salinity was lower than in the salt-encrusted shale sample and 3) the presence of NO_3^- in the shale counteracted any ill effects of the NH_4^+.

F. Leaf growth and water use of *Atriplex confertifolia* in response to NaCl and Na_2SO_4.

To test the salt tolerance of shadscale, eight-hundred grams of desert soil, collected from a shadscale (*Atriplex confertifolia*) community near the Utah Federal oil shale lease tracts, were placed in each of eighteen 24-ounce cottage cheese cartons. Rooted cuttings of *Atriplex confertifolia* were planted one per pot. Each pot was fertilized with one g NH_4NO_3 and one g treble super phosphate and watered by weight to produce and maintain a soil moisture of 10 percent. NaCl and Na_2SO_4 in solution were added gradually over a period of 2 weeks to produce soil osmotic potentials of o, -10, and 020 atmospheres at 10 percent soil moisture. During a one-week period, just prior to the harvest of leaves, the amount of water used (transpired and evaporated) was determined daily as the weight of water added which was necessary to bring the pots up to a predetermined weight (i.e. weight to give 10 percent soil moisture). The leaves were harvested three weeks after all the salts had been added.

Table 14 shows the total dry weight of leaves produced over the course of the experiment and the grams water used per day per gram dry leaf tissue for a seven-day period. The addition of NaCl and Na_2SO_4 to a level of -10 atm significantly increased the yield of leaf tissue above that of the control (no salts added). There was no significant difference in leaf growth between the -20 atmosphere treatments of NaCl or Na_2SO_4 and the control. However, the -20 atm mixed salt (-10 atm NaCl plus -10 atm Na_2SO_4) treatment did significantly reduce leaf growth. The water use efficiencies (water used per gram dry leaf tissue) followed the same trend as the yield of leaf tissue.

Table 14. Leaf growth and water use of *Atriplex confertifolia* in response to NaCl and Na_2SO_4 (3 replications per treatment)

	Control	-10 atm NaCl	-10 atm Na_2SO_4	-20 atm NaCl	-20 atm Na_2SO_4	-20 atm NaCl + Na_2SO_4
Dry weight of leaves (grams)	.4794 b	.6148 a	.5538 a	.4518 b	.4323 bc	.3724 c
Grams H_2O/day/gram dry leaf (7 days, 10% soil moisture)	73.6	59.7	52.7	73.0	73.0	81.7

Means (3 replications) followed by the same letter are not significantly different at the .05 level using Duncan's multiple range test. At 10.0 % soil moisture 0.2403 me NaCl or O_4 were added for each 100 g soil to produce an osmotic potential of -1 atm.

G. Growth and water use of *Atriplex canescens* in response to NaCl and Na_2SO_4.

To test the salt tolerance of *Atriplex canescens*, seeds were germinated in moist sand and transplanted to plastic-lined milk cartons containing 1800g of nonsaline, sandy loam soil. When the seedlings were 10 to 14 cm tall, NaCl or Na_2SO_4 were added gradually over a two-week period to produce soil osmotic potentials of 0, -10 or -25 atm. Following the salinization period, the height and water use of each plant was measured daily for 15 days, and the dry weight of leaves was determined at the conclusion of the experiment. There were five replications per treatment.

The production of leaf tissue was not reduced by either the -10 atm NaCl, -10 atm Na_2SO_4 or -25 atm Na_2SO_4 treatments, but leaf tissue production was reduced by the -25 atm NaCl treatment and was reduced even further by the -25 atm mixed salt (-12.5 atm NaCl plus -12.5 atm Na_2SO_4) treatment (Table 15). Water consumption over a ten-day period per gram of dry leaf tissue was reduced in the -25 atm treatments of NaCl and Na_2SO_4 when soil moisture was maintained at 9.1 percent. During a five-day period when no water was added the water consumption per gram of dry leaf tissue was significantly less in the -10 atm NaCl treatment than in the control. Water consumption was further reduced in the -25 atm NaCl treatment and, to a slightly lesser extent, in the -25 atm Na_2SO_4 treatment. The relative change in height during the fifteen-day period was greatest in the control, with the -10 atm treatments of NaCl and Na_2SO_4 reducing it only slightly. The -25 atm salt treatments reduced the relative change in height still further, but the Na_2SO_4 treatment was less inhibitory than the NaCl treatment. The -25 atm combined salt treatment was intermediate between the two single salt treatments.

Table 15. Growth and water use of *Atriplex canescens* in response to NaCl and Na_2SO_4 in soil (9.1 percent soil moisture).

	Control	-10 atm NaCl	-10 atm Na_2SO_4	-25 atm NaCl	-25 atm Na_2SO_4	-25 atm NaCl+Na_2SO_4
Dry weight of leaves (grams)	1.5461a	1.5618a	1.5263ab	1.2958b	1.6795a	0.9846c
ater use (10 days at field capacity, 9.1% moisture)	*174.7ab	170.8b	163.3b	145.7c	157.3	188.3a
ater use (5 days not watered)	* 83.8a	73.0b	82.5a	60.4c	66.4b	84.2a
hange in height, cm (15-day period)	* 6.2a	6.2a	6.1a	2.2c	4.1b	2.5c
elative change in height (change in height/starting height)	.3767a	.3106b	.3110b	.1035c	.1823c	.1552cd

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eans (5 replications) in each row followed by the same letter are not significantly different at the .05 level using Duncan's multiple range test.

g[illegible]s water transpired and evaporated per gram dry leaf tissue.

t 9.1% soil moisture an osmotic potential of -1 atm was produced for each 0.2187 me NaCl or 0.2431 me Na_2SO_4 added per 100 g soil.

NaCl and Na_2SO_4 are the two most common salts found in salt desert ecosystems, and high tolerance to these salts is important to the growth and reproduction of many salt desert plant species. The tolerance of *Atriplex canescens* to high Na_2SO_4 salinity is of special interest since the predominant salt in most processed oil shale samples from Colorado and Utah is Na_2SO_4. In some cases $MgSO_4$ is also high and further research is planned involving this salt.

Although height growth of *Atriplex canescens* was reduced at all salt concentrations used, the yield of leaf tissue was not reduced by up to -25 atm Na_2SO_4, and water use efficiency was enhanced by salinity.

H. Greenhouse performance of selected shrub grass and forbs in gallon cans filled with Paraho processed shale.

A preliminary study of plant performance in gallon cans filled with Paraho processed shale under propagation greenhouse conditions was run at Snow Field Station during the winter and spring of 1976. Those species which showed the highest and best survival were cuneate saltbush, greasewood, shadscale saltbush, fourwing saltbush and seepweed (Table 16). Factors such as drought resistance and high temperature tolerance were not in effect during the period of the study. However, the study showed that placing bare-root seedlings in processed shale gives a lower survival rate than using container-grown transplants.

Table 16.
Survival and Growth of Shrubs Transplanted Into Gallon Pots of Paraho Processed Shale. Averages of three replications.

Species	Treatment[1]	Survival[2]			Average Height	
		Dead	Stress	Good	Dec. 1975	June 30, 1976
		%	%	%	cm	cm
Cuneate saltbush	A	–	33	67	2.8	9.0
	B	67	–	33	1.8	21.0
	C	–	33	67	3.3	6.8
	D	67	–	33	2.8	15.0
	E	–	–	100	–	12.5
Mat saltbush	A	–	67	33	4.5	6.5
	B	33	–	67	5.0	8.0
	C	–	100	–	3.3	5.3
	D	67	–	33	2.7	7.0
	E	–	67	33	2.8	6.0
Greasewood	A	33	67	–	22.3	12.5
	B	–	33	67	17.7	21.3
	C	–	–	100	19.0	23.2
	D	–	33	67	19.0	24.3
	E	–	33	67	25.5	30.3
Big sagebrush	A	100	–	–	4.8	–
	B	100	–	–	6.0	–
	C	67	–	33	3.8	4.5
	D	67	33	–	3.2	4.5
	E	–	33	67	4.5	6.3
Shadscale saltbush	A	–	67	33	4.7	5.5
	B	100	–	–	5.8	–
	C	–	–	100	3.3	7.0
	D	–	–	100	5.0	17.3
	E	–	–	100	5.3	15.5
Fourwing saltbush	A	33	67	–	3.8	7.0
	B	67	33	–	4.2	5.0
	C	33	–	67	1.7	20.7
	D	33	–	67	2.2	36.3
	E	67	–	33	1.5	53.0
Siberian salt tree	A	67	33	–	7.5	6.0
	B	100	–	–	8.0	–
	C	–	67	33	6.8	7.5
	D	–	33	67	6.3	6.8
	E	100	–	–	4.5	–

Treatments[1] Transplanted into shale Dec.10-30,1975

A. Bare root plant in spent shale
B. Bare root plant in spent shale plus fertility added at rate of 100 N per acre and 100 P_2O_5 per acre.
C. Container grown plant in spent shale
D. Container grown plant in spent shale plus fertility same as Treatment B.
E. Container grown plant in regular soil.

Survival[2] - Dead; Stress, plants alive but poor growth; Good, plants healthy.

IX. PLANT VEGETATIVE PROPAGATION STUDIES

Our research continues on propagation problems with native species. In some species seed germination occurs readily and at a high percentage while in others hard seed, dormancy, poor seed yield and low germination cause us to seek propagation of plants by vegetative means, such as rooting of cuttings. An additional benefit of vegetative propagation is the provision of planting materials with the identical genetic make up as the parent plant. In some situations there would be a decided advantage to have the same genetic characteristics in an entire group of plants where palatability, tolerance to salinity and growth habit are critical.

A. Rooting of big sagebrush (*Artemisia tridentata*) cuttings.

Big sagebrush (*Artemisia tridentata*) has given variable results in attempts to root cuttings from mature plants. Recent studies have been conducted to test for: 1) variability in rooting response among several plants to concentrations of Indolebutyric Acid (IBA), a root-promoting hormone and 2) rooting response to IBA treatments at different phenological stages (dormant vs. post dormant).

The big sagebrush rooting study involved four collection times two weeks apart starting on the last week of March in 1976. A total of 2,000 cuttings were tested. Variability between plants in rooting ability seems to be the single, most important factor in solving the problem of vegetative propagation of big sagebrush. The causes for the high variability found between seemingly identical plants is unknown at this moment. However, some plants show a marked ability to respond to high levels of IBA (2.0%) where others fail to respond at all. Thus, any program to vegetatively propagate big sagebrush should first identify individual plants which will root when treated with IBA.

In the testing of rooting response at different periods of growth, it was observed that plants still dormant show the highest rooting response to hormones. As the plants progress from the dormant condition in the late winter and become physiologically active as the new growing season begins, the rooting response decreases. By the time the active growth period is reached the ability to respond to hormone treatments is almost completely lost. This decrease in rooting can be associated with tissue and physiological changes in the plant stem. All of the nontreated cuttings failed to root, and the response to the high level of IBA (2.0%) was markedly highen than the response to low IBA level (0.3%).

B. Rooting of cuneate saltbush (*Atriplex cuneata*) cuttings.

To provide rooted cuttings of cuneate saltbush for a greenhouse experiment it was necessary to conduct a study of its rooting habits. Cuttings of four *Atriplex cuneata* plants were collected near Evacuation Creek on March 22, 1976. Five cm long sections of the shoots were dipped in rooting powder container 0.8 percent IBA (indolebutyric acid) and placed in Jiffy No. 9 peat pellets. The cuttings were kept in a humidity chamber (clear polyethylene covering a wooden frame) in a greenhouse and were watered daily. Temperatures ranged from 1°C to 30°C. After 30 days the number of rooted cuttings was determined (Table 17).

Cuttings of *Atriplex corrugata* and *Grayia brandegei* were collected from Mancos Shale derieved soil at Devils Playground (a few miles west of Bonanza, Utah) on April 16, 1976. On the same date *Grayia spinosa* and *Ceratoides lanata* cuttings were collected near the federal oil shale tracts Ua and Ub. The cuttings were treated as the *Atriplex cuneata* above except that temperatures occasionally exceeded 35°C. The rooting of *Ceratoides lanata* and *Atriplex corrugata* cuttings after 30 days is shown in Table 18. Both *Grayia brandegei* and *Grayia spinosa* failed to root and are not shown.

Table 17. Percent rooting of *Atriplex cuneata* cuttings after 30 days. (Collected near Evacuation Creek March 22, 1976, and treated with 0.8 percent IBA).

Plant	Number of Cuttings	Number Rooted	Percent Rooted
A	14	10	71.4
B	35	24	68.6
C	21	16	76.2
D	98	35	35.7
TOTAL	168	85	50.6

Table 18. Percent rooting after 30 days of *Ceratoides lanata* and *Atriplex corrugata* cuttings collected April 16, 1976, and treated with 0.8 percent IBA.

Species	Number of cuttings	Number Rooted	Percent Rooted
Ceratoides lanata	119	53	45.4
Atriplex corrugata	98	49	50.0

VIII. REHABILITATION PLANTINGS ON DISTURBED SITES

Two principal studies of disturbed site rehabilitation have been established. The first study was started in April, 1955 and involved spring planting of almost 1000 bare-root shrub seedlings on four disturbed sites. The second study was more complex and involved planting of seeds, bare-root seedlings and container-grown plants in the fall of 1975 and in the spring of 1976. in three locations on the oil shale tracts. Both grasses and shrubs were included.

Additional field plantings include transplanting of container-grown shrubs and grasses on processed shale containers at the Section 6 research site, a study of shrub root-pruning during nursery propagation, an evaluation of antitranspirants on field-planted shrub seedlings and an observation nursery.

During the week of June 7-12 all plots and plantings were evaluated for survival and growth. Results from the first shrub planting in spring 1975 are considered to be near final because plants ha a full range of seasons to test their survivability. Plantings in the spring of 1976 face a more droughty condition than those in 1975.

A. Plantings of bare-root seedlings on disturbed sites, April 25-26, 1976

A summary of survival for nine species indicates a reduction in survival since the plots were established (Table 19). The greatest mortality occurred with rubber rabbitbrush which has only 11 percent of the original number surviving. Greasewood, cuneate saltbush, shadscale and spreading rabbitbrush are 10-30 percent lower than big sagebrush, black sagebrush and four-wing saltbush. Rabbitbrush appears to have survival problems as does spreading rabbitbrush on very dry sites.

Survival of shrub seedlings was considerably influenced by site conditions, such as soil texture, degree of disturbance, salinity and competing weeds. Drill site G-8 appears to have the most adverse conditions for seedling establishment as compared with the other drill sites (Table 19). The best adapted species for site G-8 are shadscale and cuneate saltbush. Spreading rabbitbrush originally looked good but apparently could not withstand the drought and salinity.

Drill hole G-13 has relatively favorable site conditions and most of the species planted there survived well. This was especially true for spreading rabbitbrush, fourwing saltbush, sagebrush and fourwing saltbush. Grazing use was heavy here.

Drill hole G-22 had many favorable conditions and all species except rubber rabbitbrush looked good. The site is dry like others but one of the biggest problems was sheep grazing and bedding down nearby.

G-5 drill site was a medium harsh drill site in comparison with other sites. Good adaptation of all species except rubber rabbitbrush was recorded.

In summarizing the results from the first transplanting study it appears that even species that are native to the area must be selected for transplanting to specific sites. Rooting habit, tolerance to salinity and drought palatability are particularly critical plant characteristics for obtaining survival on harsh sites. Further study is needed to better identify the critical plant and site features that are important in obtaining planting success with bare-root seedlings.

Preparation of planting materials by growing them in containers prior to outplanting is a means of further increasing survival. Source of plant materials does not appear to be as critical for survival as for growth

Table 19. Comparison of Shrub Species Survival at Four Drill Site Locations and at Three Dates - Spring and Fall, 1975 and Spring 1976 following one year of field growth.

Plant Species	G-5	G-22	G-8	G-13	Average
	%	%	%	%	%
A. Greasewood					
June 1975	85	93	8	70	64
Oct. 1975	63	90	0	45	49
June 1976	45	63	0	40	37
B. Big sagebrush					
June 1975	95	98	68	100	90
Oct. 1975	93	90	40	97	80
June 1976	70	87	15	70	60
C. Fourwing saltbush					
June 1975	95	100	80	90	92
Oct. 1975	88	95	65	83	83
June 1976	70	87	25	75	64
D. Black sagebrush					
June 1975	90	100			95
Oct. 1975	80	90			85
June 1976	70	77			73
E. Rubber rabbitbrush					
June 1975	87	78			83
Oct. 1975	35	67			51
June 1976	18	5			11
F. Winterfat					
June 1975	85	78			80
Oct. 1975	65	73			69
June 1976	50	47			49
G. Cuneate saltbush					
June 1975			80	85	83
Oct. 1975			65	63	64
June 1976			35	23	29
H. Shadscale					
June 1975			55	53	54
Oct. 1975			55	50	53
June 1976			40	25	33
I. Spreading rabbitbrush					
June 1975			90	98	94
Oct. 1975			2	85	43
June 1976			0	85	42
Average survival in June 1976 for sites	54	61	19	53	

(Table 20). Losses of seedlings appeared to be caused more from rodent and sheep damage than from environmental stress.

Considerably higher success in fourwing saltbush seedling survival has been observed with container-grown planting stock than bare root (Table 21). A comparison of container-grown plants with bare-root transplants at each of the drill site planting areas indicates a very favorable planting success with container-grown plants. About half of the losses of container-grown plants can be attributed to browsing by sheep and rodents. One of the main advantages of using the container-grown plants is the rapid growth obtained because transplanting shock is minimized and the plants can better withstand grazing use by sheep and rodents.

B. A comparison of fall versus spring seeding, planting of bare-root seedlings and planting of container-grown shrubs and grasses

A study was established in the fall of 1975 to compare fall and spring planting of shrubs and grass planting stock and seeds. Study plots in three locations, drill hole G 3, drill hole G-17 and the section 6 research site; were selected and fenced with one inch wire netting to exclude small mammals and sheep. Only native shrubs and grasses were included in the study because of their existing adaptation to the local environment. The study was designed as a randomized block with three planting sites, nine species of shrubs, five speices of grasses, two seasons of planting, three types of planting materials (seeds, bare-root seedlings and container-grown plants), three cultural treatments after planting (control, liter of water at time of planting, water plus fertilizer at time of planting) and four replications.

Initial results of success in establishment was evaluated in June, 1976. The following evaluations provide some indication of the relative effectiveness of the treatments, planting season and methods of propagation for certain shrubs and grasses.

Table 20. Comparison of survival and growth of plants at three observation dates (June 12, 1975, October 21-31, 1975, and June 8-10, 1976). Plants were grown in containers from cuttings.

Plant Source	Sex	Number Planted	Survival June 1975	Survival Oct. 1975	Survival June 1976	Growth June 1975	Growth Oct. 1975	Growth June 1976
			%	%	%	cm.	cm.	cm.
Atca UB1	Female	16	94	94	81	14	37	31
Atca UB2	Female	14	100	100	86	16	32	25
Atca UB3	Female	14	100	100	86	17	41	38
Atca UB6	Male	10	100	100	100	18	39	42

Table 21. Survival comparison of bare-root and container grown Fourwing saltbush transplants at each of the four Drill Sites at the end of the first growing season and following one year of field growth.

Location (Drill Site)	Survival Bare-Root Oct. 1975	Survival Bare-Root June 1976	Survival Container Oct. 1975	Survival Container June 1976
	%	%	%	%
G-5	89(5)*	70(12)	100	92(1)*
G-8	65(14)	25(30)	100	92(1)
G-13	83(7)	75(10)	100	86(2)
G-22	95(2)	87(5)	94(1)	81(3)

*Number of plants that died shown in parenthesis.

Direct seeding is often considered a natural approach to revegetation but under arid and semi arid conditions the percent of success may be low. In June, 1976 the initial count of seedlings present from October, 1975 and April, 1976 direct seeding of nine shrub species ranged from 0 to 129 (Table 22). As a general rule those species with good success in the fall were also good in the spring. Survival through the long, dry summer will be necessary before any conclusions can be drawn.

Survival of container-grown planting stock was observed to be higher than that of bare-root planting stock in the first study on disturbed sites. In the fall-spring study no clear distinction can be drawn until all plants have gone through a summer and winter season. Table 23 does not show any trends over all of the planting sites or post-planting treatments.

There was a higher survival percentage for container-grown plants than for bare-root plants when averaged over all planting sites and follow up treatment (Table 24).

Direct seeding of grasses gave higher success than with the shrubs (Table 25). Russian wildrye (*Elymus junceus*) and crested wheatgrass (*Agropyron cirstatum*), two species recommended for seeding rangelands, were three to four times as high in percent initial establishment as the local indian ricegrass (*Oryzopsis hymenoides*) and needle-and-thread grass (*Stipa comata*). Bottlebrush squirreltail (*Sitanion hystrix*) was intermediate between the two high species and the two low ones.

There has been insufficient time for an evaluation of the establishment success for bare-root and container-grown clones of the five grasses included

Table 22. Comparison of Direct Seeding Nine Shrub Species At Three Locations and At Two Dates - Fall and Spring.

Species	Drill Hole G-3 Fall	Drill Hole G-3 Spring	Drill Hole G-17 Fall	Drill Hole G-17 Spring	Section 6 Fall	Section 6 Spring	Total Fall	Total Spring
	No.	No.	No.	No.	No.	No.	No.	No.
Greasewood	25	17	0	10	1	12	26	39
Fourwing saltbush	4	58	1	8	1	63	6	129
Shadscale	0	0	0	0	0	4	0	4
Cuneate saltbush	1	2	0	0	0	1	1	3
Winterfat	27	19	0	12	39	9	66	40
Greenes rabbitbrush	4	2	0	0	3	0	7	2
Black sagebrush	1	0	0	0	4	0	5	0
Big sagebrush	7	0	0	0	2	1	9	1
Spreading rabbitbrush	9	8	4	2	16	1	29	11

Table 23. Comparison in Transplanting at Three Locations, Nine Shrub Species Using Two Methods, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons - Fall and Spring. Averages From Four Replications.

Species	Treatments*	Drill Hole G-3	Drill Hole C-17	Section 6	Average of 3 Locations
		%	%	%	%
Cuneate saltbush	F BR A	100	50	75	75
	F BR B	75	100	50	75
	F BR C	50	100	100	83
	S BR A	100	100	100	100
	S BR B	100	100	100	100
	S BR C	75	100	75	83
	F CO A	100	75	100	92
	F CO B	75	100	75	83
	F CO C	50	50	75	58
	S CO A	75	100	100	92
	S CO B	100	100	100	100
	S CO C	100	100	100	100
Winterfat	F BR A	50	75	100	75
	F BR B	50	50	50	50
	F BR C	75	25	75	58
	S BR A	75	100	75	83
	S BR B	75	100	75	83
	S BR C	100	100	100	100
	F CO A	100	75	75	83
	F CO B	100	75	100	92
	F CO C	100	75	75	83
	S CO A	100	75	100	92
	S CO B	100	100	100	100
	S CO C	100	75	100	92
Greenes rabbitbrush	F BR A	75	50	75	67
	F BR B	100	75	75	83
	F BR C	75	100	75	83
	S BR A	75	100	50	75
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	75	100	75	83
	F CO B	50	100	75	75
	F CO C	100	100	50	83
	S CO A	100	100	100	100
	S CO B	100	100	100	100
	S CO C	100	100	100	100

Table 23 (continued)
Comparison in Transplanting at Three Locations, Nine Shrub Species Using Two Methods, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons - Fall and Spring. Averages From Four Replications.

Species	Treatments*	Drill Hole G-3	Drill Hole G-17	Section 6	Average of 3 Locations
		%	%	%	%
Black sagebrush	F BR A	100	100	100	100
	F BR B	100	100	100	100
	F BR C	75	100	100	92
	S BR A	100	100	100	100
	S BR B	100	100	100	100
	S BR C	75	75	100	83
	F CO A	75	100	100	92
	F CO B	100	100	100	100
	F CO C	75	100	100	92
	S CO A	100	100	100	100
	S CO B	100	100	100	100
	S CO C	100	100	100	100
Big sagebrush	F BR A	25	100	50	58
	F BR B	100	100	100	100
	F BR C	75	100	100	92
	S BR A	100	100	25	75
	S BR B	100	100	75	92
	S BR C	100	100	50	83
	F CO A	100	100	75	92
	F CO B	100	100	100	100
	F CO C	100	100	100	100
	S CO A	100	100	100	100
	S CO B	100	100	75	92
	S CO C	100	100	100	100
Spreading rabbitbrush	F BR A	75	75	100	83
	F BR B	100	100	75	92
	F BR C	100	75	75	83
	S BR A	100	100	100	100
	S BR B	75	100	100	92
	S BR C	100	100	100	100
	F CO A	100	50	100	83
	F CO B	100	25	100	75
	F CO C	100	75	100	92
	S CO A	100	100	100	100
	S CO B	100	100	75	92
	S CO C	100	100	100	100

Table 23 (continued)

Comparison in Transplanting at Three Locations, Nine Shrub Species Using Two Methods, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons - Fall and Spring. Averages from four replications.

Species	Treatments*	Drill Hole G-3	Drill Hole G-37	Section 6	Average of 3 Locations
		%	%	%	%
Greasewood	F BR A	100	50	75	75
	F BR B	100	25	25	50
	F BR C	100	25	50	58
	S BR A	25	100	75	67
	S BR B	100	75	100	92
	S BR C	100	75	100	92
	F CO A	100	75	100	92
	F CO B	100	100	100	100
	F CO C	75	100	100	92
	S CO A	100	50	100	83
	S CO B	100	100	100	100
	S CO C	100	100	100	100
Fourwing saltbush	F BR A	25	50	0	25
	F BR B	50	25	0	25
	F BR C	0	25	0	8
	S BR A	100	100	100	100
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	75	75	75	75
	F CO B	100	100	75	92
	F CO C	25	50	50	42
	S CO A	100	100	100	100
	S CO B	100	100	100	100
	S CO C	100	100	100	100
Shadscale saltbush	F BR A	50	75	50	58
	F BR B	75	100	100	92
	F BR C	75	75	100	83
	S BR A	100	100	100	100
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	100	75	100	92
	F CO B	75	100	100	92
	F CO C	75	75	100	83
	S CO A	100	50	75	75
	S CO B	100	100	100	100
	S CO C	100	100	100	100

Table 23 (continued)

Comparison in Transplanting at Three Locations, Nine Shurb Species Using Two Methods, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons - Fall and Spring. Averages From Four Replications.

Treatments* and Seasons

F = Fall
S = Spring

BR = Bare-root transplanting stock
CO = Container grown transplanting stock

A = Control
B = Water at time of planting
C = Water and fertilizer at time of planting

Table 24. Summary of Nine Shrub Species Using Two Methods of Planting at Two Seasons and at Three Locations. Averages of three treatments and four replications.

Species	Fall Bare-Root Stock	 Container Stock	Spring Bare-Root Stock	 Container Stock
	%	%	%	%
Greasewood	61	95	84	94
Fourwing saltbush	19	70	100	100
Shadscale saltbush	78	89	100	92
Cuneate saltbush	78	78	94	97
Winterfat	61	86	89	95
Greenes Rabbitbrush	78	80	92	100
Black sagebrush	97	95	94	100
Big sagebrush	83	97	83	97
Spreading rabbitbrush	86	83	97	97
Average Total	71	86	93	97

Table 25. Comparison of Direct Seeding Five Grass Species at Three Locations and at Two Dates - Fall and Spring.

	Drill Hole G-3		Drill Hole G-17		Section 6		Total	
Species	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
	%	%	%	%	%	%	%	%
Indian rice grass	25	6	31	19	25	0	27	8
Needle and Thread grass	19	19	50	12	63	25	44	19
Fairway crested	31	75	81	81	100	87	71	81
Russian wild rye grass	19	63	37	81	40	72	32	72
Bottlebrush squirreltail grass	37	69	75	69	94	100	69	63

in the study (Table 26). Spring plantings looked better than fall plantings when evaluated on June 9, 1976, but this trend is expected to reverse after the long, dry summer.

It appears that direct planting of bare-root clones (divisions of a bunchgrass) of grass and container-grown (for an advance period) grasses are nearly equal in survival success (Table 27). So far in this study the survival success has been very good and indicate that fall and spring planting give good results.

C. Effect of root pruning during nursery propagation of shrubs.

To test whether root pruning of seedlings during nursery propagation would promote greater lateral root growth a small study was initiated at the Snow Field Station. Table 28 shows that no differences in establishment occurred as a result of the root pruning treatment or follow-up irrigation. If any advantage to survival in terms of shallow root concentration occurs, a longer time of observation will be required.

D. Antidesiccant chemicals to aid in survival of bare-root transplants.

Most species of plants loose a high amount of water by transpiration during the transplanting adjustment period. Excessive moisture loss can cause death of the transplant. To ameliorate the transplanting stress, antidesiccants have been developed. To test the effectiveness of three antidesiccants on five native shrub species a small study was initiated in April, 1976. Initial survival success was evaluated on June 10.

The antidesiccants appeared to give a small advantage to plant survival as compared with the non-treated plants (Table 29). Dipping plants after digging appeared to be 10 percent more effective than spraying. Further

Table 26. Comparison in Transplanting at Three Locations, Five Grass Species Using Two Methods of Planting, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons, Fall and Spring. Averages from four replications at each location.

Species	Treatments*	Drill Hole C-3	Drill Hole G-17	Section 6	Average of 3 Locations
		%	%	%	%
Indian rice grass	F BR A	50	25	0	25
	F BR B	0	75	0	25
	F BR C	75	75	0	50
	S BR A	50	75	75	67
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	75	75	25	58
	F CO B	75	50	50	58
	F CO C	75	100	75	83
	S CO A	75	25	100	67
	S CO B	100	50	100	83
	S CO C	75	50	100	75
Needle & thread grass	F BR A	75	75	0	50
	F BR B	75	75	0	50
	F BR C	25	100	25	50
	S BR A	25	75	50	50
	S BR B	75	100	25	67
	S BR C	100	75	75	83
	F CO A	50	100	100	83
	F CO B	75	100	100	92
	F CO C	75	50	100	75
	S CO A	100	75	75	83
	S CO B	100	100	100	100
	S CO C	100	100	100	100
Fairway wheatgrass	F BR A	100	100	75	92
	F BR B	75	75	50	67
	F BR C	75	50	50	58
	S BR A	100	100	100	100
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	50	100	100	83
	F CO B	75	100	100	92
	F CO C	75	100	100	92
	S CO A	50	100	100	83
	S CO B	100	100	75	92
	S CO C	100	75	75	83

Table 26 (continued)

. Comparison in Transplanting at Three Locations, Five Grass Species Using Two Methods of Planting, Bare-root and Container Grown Stock, Three Treatments and at Two Seasons, Fall and Spring. Averages from four replications at each location.

Species	Treatments*	Drill Hole G-3	Drill Hole G-17	Section 6	Average of 3 Locations
		%	%	%	%
Western wheat grass	F BR A	100	75	100	92
	F BR B	100	75	75	83
	F BR C	100	100	100	100
	S BR A	25	75	100	67
	S BR B	100	100	100	100
	S BR C	100	100	100	100
	F CO A	100	100	100	100
	F CO B	100	100	100	100
	F CO C	100	100	100	100
	S CO A	75	100	100	92
	S CO B	100	100	75	92
	S CO C	100	100	100	100
Beardless bluebunch grass	F BR A	100	100	100	100
	F BR B	50	75	100	75
	F BR C	75	25	75	58
	S BR A	50	100	100	83
	S BR B	75	75	100	83
	S BR C	100	50	100	83
	F CO A	100	100	75	92
	F CO B	75	75	100	83
	F CO C	75	75	100	83
	S CO A	100	100	75	92
	S CO B	100	75	100	92
	S CO C	100	75	100	92

Treatments* and Seasons

F = Fall
S = Spring

BR = Bare-root transplanting stock
CO = Container grown transplanting stock

A = Control
B = Water at time of planting
C = Water and fertilizer at time of planting

Table 27. Summary of five grass species using two methods of planting at two seasons and at three locations. Averages of three treatments and four replications.

Species	Fall Bare-Root Stock	 Container Stock	Spring Bare-Root Stock	 Container Stock
	%	%	%	%
Indian rice grass	33	66	89	75
Needle and Thread grass	50	83	67	94
Fairway wheat grass	72	90	100	86
Western wheat grass	92	100	89	95
Beardless bluebunch wheat grass	78	86	83	92
Average Total	65	85	85	88

Table 28. Effect of Pruning On Establishment And Survival Of Bare-root Shrub Transplants. Per cent live plants from six replications.

	Treatments[1]							
Species	1	2	3	4	5	6	7	8
	%	%	%	%	%	%	%	%
Siberian Salttree	100	100	100	100	100	100	100	100
Fourwing saltbush	100	100	100	100	100	100	100	100
Fourwing saltbush	100	83	100	100	100	100	100	100
Fourwing saltbush	100	100	83	100	100	83	100	100
Fourwing saltbush	100	100	100	100	100	100	100	100
Winterfat	100	100	67	83	100	67	67	67

Treatments[1]

	Top	Root	
1.	Unpruned	Unpruned	Control
2.	Unpruned	Unpruned	Watered (1 l. at time of planting)
3.	Pruned	Unpruned	Control
4.	Pruned	Unpruned	Watered (1 l. at time of planting)
5.	Unpruned	Pruned	Control
6.	Unpruned	Pruned	Watered (1 l. at time of planting)
7.	Pruned	Pruned	Control
8.	Pruned	Pruned	Watered (1 l. at time of planting)

The roots were pruned by undercutting in the fall of 1975 and lifted April 20, 1976. The vegetative top growth was pruned April 21, 1976.

Planting date: April 21, 1976.
Observation date: June 10, 1976.

Table 29. Effect of Anti-desiccant Chemicals On Survival Of Bare-rooted Transplants When Field Planted. Data are the average of four replications.

Species	Treatments[1] 1	2	3	4
	%	%	%	%
Winterfat	25	25	50	75
Big sagebrush	100	50	100	50
Shadscale saltbush	50	100	75	100
Siberian salt tree	100	100	100	100
Fourwing saltbush	50	100	100	100
Average	65	75	85	85

Treatments[1]

1. Control
2. Dig plant & spray with Wilt Proof
3. Dig plant & dip in solution of Weather Shield XX 1 to 1 concentration
4. Dig plant and dip in a 1 to 10 solution of Wilt Proof formula NCF

evaluation at the end of the dry summer period will help to determine if the initial advantage of the antidesiccants gives the seedlings any subsequent help through the summer.

E. Survival of shrub and grass transplants on Paraho processed shale.

To evaluate the performance of container-grown transplants on Paraho-processed shale, eight soil pits were excavated to 30 cm and lined with rought sawed lumber. Four pits were 2 x 2 meters and four were 1 x 1 meter in size. Half of each pit was filled with Paraho-processed shale and the other half received 15 cm of Paraho processed shale over lain with 15 cm of soil. Shrub transplants were planted in the large pits and grass and forb transplants were planted in the smaller pits in April 1976. An evaluation of initial survival was made on June 11, 1976.

After two months the survival of saltbush, winterfat and greasewood transplants was high (Table 30). Sagebrush and rabbitbrush were lower in survival and were also showing signs of stress.

The grass and forb transplants also showed an initial high survival percentage but some were showing stress after two months (Table 31). Seepweed (*Suaeda nigra*) and prostrate summer cypress (*Kochia prostrata*) appeared to be highly tolerant to the salinity and high pH of the processed shale.

Performance and survival of plants grown in processed shale under field conditions will be observed with particular interest during the next year. Specieal interest will be given to observations of the shale itself because two of each four pits contain paraho-processed Utah shale, which was analyzed to have a higher pH than the other processed shale supply used.

Table 30. Effect of Paraho Processed Shale On Performance of Container Grown Shrubs. Summary of four replications[1] showing per cent survival in a stressed or good growing condition.

	Treatments[2]					
	Shale			Soil Over Shale		
Species	Stress	Good	Total Live Plants	Stress	Good	Total Live Plants
	%	%	%	%	%	%
Fourwing saltbush	42	50	92	–	100	100
Cuneate saltbush	67	25	92	–	100	100
Shadscale	50	42	92	–	100	100
Greasewood	42	33	75	–	100	100
Black sagebrush	83	–	83	42	50	92
Douglas rabbitbrush	50	–	50	50	42	92
Winterfat	58	25	83	17	83	100
Big sagebrush	75	–	75	67	17	83

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[1] There were three plants per replication in each growth material or a total of 12 in shale and 12 in soil over shale.

[2] Shale consists of 30 cm. of paraho processed shale. Soil over shale consists of 15 cm. of paraho processed shale overlaid with 15 cm. of local soil.

Planting date: April 8 thru April 27, 1976.
Observation date for survival: June 10, 1976

Table 31. Effect of Paraho Processed Shale on Performance of Container Grown Grass and Forb Species. Summary of four replications[1] showing per cent of live plants in a stressed or good growing condition.

	Treatments[2]					
	Shale			Soil Over Shale		
Species	Stress	Good	Total Live Plants	Stress	Good	Total Live Plants
	%	%	%	%	%	%
Indian ricegrass	81	13	94	50	50	100
Sand dropseed (Reps 1 & 2)	63	25	87	50	50	100
Russian wildrye grass (Reps 3 & 4)	13	87	100	-	100	100
Western wheatgrass	56	25	81	13	87	100
Needle and thread grass	87	6	94	13	81	94
Saltgrass	44	56	100	63	37	100
Seepweed	-	81	81	-	100	100
Prostrate summer cypress	25	63	87	-	100	100

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1. There were four plants per replication in each growth material or a total of sixteen.
2. Shale consists of 30 cm. of paraho processed shale. Soil over shale consists of 15 cm. of paraho processed shale overlaid with 15 cm. of local soil.

Planting date: April 9 thru April 27, 1976
Plant survival observations: June 10, 1976

F. Field observation nursery at Section 6 research site.

A field nursery and species observation planting was established at the Section 6 research site. This nursery will be used as a locale to plant native species from the immediate region and from other similar climates. The main use of the nursery will be as a comparison with plants in ongoing studies and as an identification of frequently discussed species for visitors. Labels with the appropriate scientific names will be placed adjacent to the species planted in the nursery (Table 32).

Table 32. Field nursery and observation garden planted in Section 6 research site. Present species planted in April, 1976.

Row	Species	Source	Date of Planting	Method of Planting
1.	*Eriogonum corymbosum*	East Duchesne, Hway 40, Duchesne Co.	April 9, 1976	Container
2.	*Eriogonum spp.*	Indian Canyon, South Duchesne, State 133, Duchesne Co.	April 9, 1976	Container
3.	*Tamarix pentandra*	White River Bridge, Bonanza, Uintah Co.	April 9, 1976	Container
4.	*Halimodendron halodendron*	Russia	April 9, 1976	Container
5.	*Agropyron spp.*	Southam Canyon, Oil Shale Tract Ua, Uintah Co.	April 9, 1976	Container
6.	*Gutierrezia sarothrae*	Oil Shale Tract Ub, Uintah Co.	April 9, 1976	Container
7.	*Artemisia pygmaea*	West Duchesne, Hway 40, Duchesne Co.	April 9, 1976	Bare root
		Drill Hole G-3, Oil Shale Tract Ua, Uintah Co.	April 9, 1976	Bare root
9.	*Oryzopsis hymenoides* (dwarf form)	Northeast Vernal, Uintah Co.	April 9, 1976	Bare root
10.	*Agropyron elongatum*	Commercial	April 22, 1976	Container
11.	*Elymus junceus*	Commercial	April 22, 1976	Container
12.	*Atriplex cuneata*	USU #325 Wildcat Mesa, Garfield Co.	April 22, 1976	Container
13.	*Kochia prostrata*	Russia	April 22, 1976	Container
14.	*Atriplex corrugata*	USU #326 Wildcat Mesa, Garfield Co.	April 22, 1976	Container

able 32. Continued

Row Species	Source	Date of Planting	Method of Planting
15. *Artemisia spinescens*	East Bonanza, Uintah Co.	April 22, 1976	Bare root
16. *Agropyron spp.*	Watson, Uintah Co.	April 22, 1976	Bare root
17. *Juniperus osteosperma*	Oil shale tract Ua, Uintah Co.	April 22, 1976	Bare root

X. SOIL SURFACE STABILIZING MATERIALS

Plots treated with six soil surface stabilizing materials were observed on June 10, 1976, approximately one year after initial application. Only the high rate of the polyvinyl acetate soil seal and the Aerospray 70 were intact to any degree. Plants of fourwing saltbush and shadscale planted at the bottom end of each plot were in excellent condition, indicating that surface runoff and the absence of plant competition were favorable for growth. No differential effect on plant growth due to any of the surface treatments was evident because of rodent or rabbit grazing on the saltbush plants.

Three groups of plots were prepared for application of surface materials in the summer after day temperatures are consistently high. Three materials will receive special attention: Aerospray 70 and Product 3011, both polyvinyl acetates; and SBR 4290, a styrene butadiene latex compound. The purpose of the 1976 tests will be to evaluate runoff produced and the persistence of materials under field conditions.

XI. RESEARCH PROPOSALS PREPARED

As requested by the terms of the research contract, additional sources of funding and development of research projects has been accomplished. Three research proposals were prepared in the period January 1 to July 1. Project titles and names of agencies to whom the proposals were sent are as follows:

A. "A State-of-the-Art Review of Rehabilitation of Western Wildlife Habitats" proposal submitted in response to Request for Proposal No. FWS-8-182 to Western Energy and Land Use Team, Fish and Wildlife Service, U.S. Department of Interior.
Date Submitted: March 26, 1976
Date Revised & Resubmitted: June 22, 1976

B. "Fertilization Criteria for Native Arid-Region Shrubs Useful for Revegetating Surface-mined Coal Areas and Processed Oil Shale." Submitted to Cooperative State Research Service, U.S. Department of Agriculture.
Date Submitted: May 10, 1976.

C. "A Pilot Scale Model of a System for Revegetation of Processed Oil Shale." Submitted to Energy Research and Development Agency.
Date Submitted: May 20, 1976
The proposal will be considered as a draft proposal for additional study and coordination with ERDA research planning.

No contracts or committments have been received on any of the three proposals at the date of this report. Favorable comments have been received on two of the proposals. Copies of the proposals are available for inspection from the Office of the Institute for Land Rehabilitation, Utah State University.

XII. PUBLICATIONS

Three publications of results were achieved during the six-month period, January 1 to June 30, 1976:

Crofts, Kent A. and Gordon Van Epps. 1976. The usefulness of shadscale in the revegetation of disturbed sites in the salt desert shrub type. Proc. Symposium and Workshop, Wildland Shrubs. pp 151-152. Provo, Utah.

McKell, C.M. 1976 Achieving effective revegetation of disposed processed oil shale: A program emphasizing natural methods in an arid environment. Utah Agric. Expt. Sta. Land Rehabilitation Series No. 1. 17 pp.

Van Epps, Gordon and C.M. McKell. 1976. Plant rehabilitation studies on disturbed soils in the oil shale region of Utah. Proc. 1976 Meetings, Society for Range Management. Omaha, Nebraska

XIII. CONTACTS AND MEETINGS

Those contacts and meetings of significance to the project include the following:

A. Society for Range Management Annual Meeting, Omaha, Nebraska. February 16-20, 1976. Gordon Van Epps attended and presented a paper on rehabilitation of disturbed sites. Results were from research under this project.

B. Advisory Committee for the Upper Colorado Environmental Plant Materials Center, Meeker, Colorado. April 7-8, 1976. C.M. McKell attended. Reviewed progress of the Center and advised on guidelines for operation of the Center.

C. Visit to Anvil Points Oil Shale Retorting Facility. April 9, 1976. C. M. McKell and Rees Madsen made the visit as guests of Ed Piper and Phil Trumbo. A review of the processed oil shale compaction study was the focus of the visit.

D. Visit to Navajo Mine and surface rehabilitation treatments, Farmington, New Mexico. May 4, 1976. A visit was made by C.M. McKell while in Farmington on business for a Utah State University project. Review surface contour re-establishment, topsoil coverage, seeded species, mulching and irrigation treatments.

E. Visit to TOSCO study site near Ouray, Utah. June 17, 1976. C.M. McKell in company with Rees Madsen, Joe Merino (TOSCO), Bob Ferguson (USFS) and representatives of Union Oil visited the TOSCO study site to review the progress to date.

XIV. RESEARCH PLANS FOR THE PERIOD 1 JULY TO 31 DECEMBER

The research program is proceeding on a broad front as is necessary to provide answers to problems posed by the rehabilitation plan described in the DDP for Tracts Ua and Ub. In addition to maintaining the present field studies and observing the results we propose to initiate the following work:

A. Set out soil surface stabilizing materials to determine their performance in water harvesting longevity under field conditions.

B. Develop a small pilot model of a processed shale pile to determine surface and subsurface water movement and salinity concentration. A series of leaching columns will be established at Logan to provide additional details to the salinity/moisture pattern of movement.

Success in receiving a favorable review of the proposal submitted to ERDA will allow us to proceed on an enlarged scale of study on the pilot model of a shale disposal pile.

C. Detailed greenhouse and laboratory study of the specific effects on plant growth of salinity in processed oil shale will be conducted. Means of amelioration of adverse effects, including addition of acids or fertilizer elements, will be studied.

D. Development of a handbook describing methods for propagation of native shrubs and grasses. This line of work has been a consistent effort during the study and will receive further emphasis as we work with various native plant species.

E. Complete the "state-of-the-art" review of literature relevant to oil shale revegetation. This project is in the early draft stage but has had to be placed aside in order to prepare research proposals and paper accompanying the DDP.

APPENDIX I.

Third Progress Report

Revegetation Studies for Disturbed Areas and Processed Shale Disposal Sites

A SELECTED BIBLIOGRAPHY OF FACTORS AFFECTING THE PROPAGATION AND ESTABLISHMENT OF NATIVE PERENNIAL *ATRIPLEX* OF THE WESTERN UNITED STATES

By

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INTRODUCTION

Germination and propagation of perennial *Atriplex* species has been of interest to plant scientists for many years. These species have many desirable attributes that place them high on the priority list for vegetating disturbed lands useful for livestock and wildlife. Among their most attractice features are their tolerance to salinity and drought and their relatively high protein content.

Methods for obtaining a consistently high germination percentage of seeds or success in vegetative propagation are not well worked out; nor is there a clear understanding of the various factors that control germination or plant growth. In spite of the research attention received by the *Atriplex* group, there is much yet to be known and conflicting results to be clarified.

This bibliography, presented in strictly alphabetical-author format, was developed to aid those who wish to know what has already been discoered and discussed relative to problems of germination and propagation of perennial *Atriplex* of the western United States. If this bibliography aids in furthering research on a valuable group of plants so that they may be useful to mankind, the effort will have been worthwhile.

Readers are urged to review the list of titles; and if there are references that should be added, I would be delighted to make such an addition.

ESTABLISHMENT OF NATIVE PERENNIAL *ATRIPLEX* OF THE WESTERN UNITED STATES

by

Kent A. Crofts

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